
MILLIMETERS
MICROCOPY RESOLUTION TEST CHART
(ANSI and ISO TEST CHART No. 2)
1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
APPLIED IMAGE, Inc
1653 East Main Street
Rochester, New York 14609
14:1

Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION

PART IV
(1899–1910)

Thomas E. Jeffrey
Lisa Gitelman
Gregory Jankunis
David W. Hutchings
Leslie Fields
Theresa M. Collins
Gregory Field
Aldo E. Salerno
Karen A. Detig
Lorie Stock

Editors

Robert Rosenberg
Director and Editor

Sponsors
Rutgers, The State University Of New Jersey
National Park Service, Edison National Historic Site
New Jersey Historical Commission
Smithsonian Institution

University Publications of America
Bethesda, MD
1999

Thomas A. Edison Papers
at
Rutgers, The State University
endorsed by
National Historical Publications and Records Commission
18 June 1981

The original documents in this edition are from the archives at the Edison National Historic Site at West Orange, New Jersey.

ISBN 0-89093-703-6

THOMAS A. EDISON PAPERS

Robert A. Rosenberg
Director and Editor

Thomas E. Jeffrey
Associate Director and Coeditor

Paul B. Israel
Managing Editor, Book Edition

Helen Endick
Assistant Director for Administration

Associate Editors
Theresa M. Collins
Lisa Gitelman
Keith A. Nier

Assistant Editors
Louis Carlat
Aldo E. Salerno

Research Associates
Gregory Jankunis
Lorie Stock

Secretary
Grace Kurkowski

Student Assistants
Amy Cohen
Bethany Jankunis
Laura Konrad
Vishal Nayak
Jessica Rosenberg
Stacey Saelg
Wojtek Szymkowiak
Matthew Wosniak

FINANCIAL CONTRIBUTORS

PRIVATE FOUNDATIONS
The Alfred P. Sloan Foundation
Charles Edison Fund
The Hyde and Watson Foundation
National Trust for the Humanities
Geraldine R. Dodge Foundation

PUBLIC FOUNDATIONS
National Science Foundation
National Endowment for the Humanities
National Historical Publications and Records Commission

PRIVATE CORPORATIONS AND INDIVIDUALS
Alabama Power Company
Anonymous
AT&T
Atlantic Electric
Association of Edison Illuminating Companies
Battelle Memorial Institute
The Boston Edison Foundation
Cabot Corporation Foundation, Inc.
Carolina Power & Light Company
Consolidated Edison Company of New York, Inc.
Consumers Power Company
Cooper Industries
Corning Incorporated
Duke Power Company
Entergy Corporation (Middle South Electric System)
Exxon Corporation
Florida Power & Light Company
General Electric Foundation
Gould Inc. Foundation
Gulf States Utilities Company
David and Nina Heitz
Hess Foundation, Inc.
Idaho Power Company
IMO Industries
International Brotherhood of Electrical Workers
Mr. and Mrs. Stanley H. Katz
Matsushita Electric Industrial Co., Ltd.
Midwest Resources, Inc.
Minnesota Power
New Jersey Bell
New York State Electric & Gas Corporation
North American Philips Corporation
Philadelphia Electric Company
Philips Lighting B.V.
Public Service Electric and Gas Company
RCA Corporation
Robert Bosch GmbH
Rochester Gas and Electric Corporation
San Diego Gas and Electric
Savannah Electric and Power Company
Schering-Plough Foundation
Texas Utilities Company
Thomas & Betts Corporation
Thomson Grand Public
Transamerica Delaval Inc.
Westinghouse Foundation
Wisconsin Public Service Corporation

START

166

A Note on the Sources

The pages which have been filmed are the best copies available. Every technical effort possible has been made to ensure legibility.

Notebook, N-04-04-27

This notebook covers the period April-July 1904. It contains notes and drawings by Edison and an unidentified experimenter regarding storage battery experiments. Most of the entries relate to problems with the foaming action of the potassium hydroxide solution and to attempts to identify a compound that would retard the foaming. There are also items pertaining to improved techniques for loading iron powder in the cell grids. Inserted into the book are approximately 20 pages of notes concerning chemicals tested for foaming. The pages are unnumbered. Approximately 50 pages have been used.

X E172 040427

N-04-04-27

April 27. 1904

Life to present time have tried lot of Munching Expts, to stop foaming in M.F. Battery, also present gases Carrying out B.P. I am now started on Ephemeline Expts, to see if the process Cannot be worked in a Commercial way

Have distilled Crude Pa Petroleum into many BP legends + Tried in battery - those of low boiling point prevent foaming, but they are too inflammable + the Vapors Carried off by the gases of Electrolysis might be dangerous in mixture if the autos or Car people dislike Vulcanite when charging. The the higher B.P are very little inflammable as their Vapor tension is low recovered by OK but they are too viscous in do not stop frothing generally but decidedly

April 27 1904

bubbles to small ones in a badly frothing cell - a curious thing is that only certain BP in Pet are unenflam but higher & lower BP are inflammable -

Have distilled Asphalt, Lignite Oil, Russian Wagout, Diesel Oil & tried the resultant distillates, all have same objection as Petroleum -

Have tried nearly all of the Essential Oils & they act better as to foaming but most are too inflammable - The best liquid so far is Amyl alkohol & is not very inflammable its objectionable on account of its narcotic effect of vapor, am making diffent Amyl Compounds to

April 27 1904

see if can't diminish inflammability + give pleasant odor + reduce vapor tension

Am trying to get all the High BP alcohols to test,

Today am distilling Castor oil to get Heptyl Hp alcohol as its BP is higher than Cetyl alcohol,

What it wants is a liquid Mobile without viscosity Limpid, high BP small Vapor tension or very little if any inflammability etc

Seems to be a long chase Agam reports so far

The foregoing point must also be looked at It must not be affected by KOH or Oxidable by the good & steel soap at KOH, Oh dear.—

April 27 1904

Have rigged up lot test tubes with Nickel Electrodes to test dry solubles with foaming KOH 20% for effect & for those acting weak for time test for both & loss by Evap

Found that the loss of ammoniacal by vapors being carried away by spraying is very great & the liquid must be perfectly free to use it except to atop a very bad foaming call for a shot rifle —

Amylene Oil 1kg —
Creosote 3 Kilos 1kg —
Benzol Tar Creosote 1kg —
Amylene Hydrate OK best yet it works fine + Very little throwing of spray with a Amylene Oil Ammonia increase spray. Unfortunately Amylene

April 28 1904

Thy

hydrate is inflammable otherwise if it had the other properties it would be all right,

Terpenol works ok its not very inflammable, its terpin hydrate, Evidently the terpinols shaved but hydrated & the more hydrated the less inflammable

Terpenol in 48 hours or less loses 1/2 & then appears not to lose any more

I can purify Terpenol by Hypo & Kofl filter through ~~Sponge~~ bone black & then air blow it to get off the most volatile & less resinous putting a little anthracene in it helps keep Kofl from mechanically ~~bringing~~ bringing out

April 28 1904

By taking Rudolf Oel amber adding at it by Hyps + KOH, + then filtering thick brown black works well very little inflammable thick of air blown wares only Ge inflam at very high temp +
Daly rigging up good apps to air blow -

Am now trying to ascertain what of the parboiling substance got into cake from mfg that causes it to foam -

Try Paper, Pine wood, Cypress wood, soft Rubber Butter Si. Acetate Soda sulphur Ferric hydroxide alumina hydrate
Good quid Celebin albanen
Felt Caps from Glen Ridge soaked in KOH Hg glycerine
glycerine + Stearic a
" " + Soap
Cotton -

April 28 1904

Good —

Distillation in big iron retort of several lbs Coal as all the coal left big Elastic residue. This was taken & put into glass retort & distilled & oil taken above 200 C & cooled in K Carbonate, Oil floated on surface took this off treated with acid Sodium Sulphite heat. The oil that floated on surface was then taken by 2 & treated hot 20% KOH twice & filtered through bone black. It works good in cool test

& its very different to get it to flash requires one minute or more with flame —

It lets the KOH through by spitting

April 28 1904

It is strange that some liquids let the bubbles through Chloroform KOH & some do not some think liquids do not let it through while some very much others let it through its the peculiar nature of the liquid possibly those liquids which are absorbing & have OH or hydrated that do not let it through so nothing can be told ahead only experiment can be used to determine this peculiarity

May 1 1904 7C

Experiments on putting different things in KOH to ascertain Cause foaming (Agitated)

Lard. 3 or 4 grammes in 2 oz KOH
No foaming

Egg Albumen - Terrible foaming a single drop of Solution in glass KOH with Concentrated of Reg KOH to go up 2" or over foam undoubtedly its albumin from the hands that Causes the foaming trouble.

Hard Rubber Chips No foam
Cotton Waste No foaming
Butter No foaming
Gelatin foams very bad - goes up on mark - about 1/4 to 1/6 of foaming Capacity of Albumen

Yellow pad paper along Concordion 1/2 to 1/2 with good KOH goes up much about 1/2 as much as Gelatin

May 1 1904

Pine wood No foam
Glycerine + Soap No foam
Sulphur "
Glycerine "
" + Stearic a "
Cyprus chips just a little
foam 1/8" foam when 1/2 + 1/2
wood + boil Koff used - solution
was dark —
Soft Rubber - No foam
Aluminum Trihydrate
Silicate Soda — No foam
Ferric hydroxide, "
Goose quill —
Fresh chips from Glen Ruby? "

After distillation of camber Oil
+ treatment Koff, its properties
of stopping foaming is much
diminished (sd) it will be
necessary to add something
to it to change its surface
tension where there is Gas

May 1 1904 Zaa

foaming, On the other hand
[illegible] bone black (acid purified)
added to cask with oil -
takes care of it -
Regarding distillation of KOH
Nitrate of Soda Turpentine stops
it all together, Pacific
amber oil as bought does
fairly well but Redistilled
amber oil acts it up
though if there is a slight
trouble to the oil the
foam stops the spilling

We have been distilling
in glass Retort Oil of
Pacific amber oil &
find that the average
very distinct BP.
173 200 210 220 253 280,
The oil of 253 BP is
greenish - volumes all above
of lower BP are yellowish
280 is very green

May 1 1904

I now evaporate down in open air on steam plate in Evap dishes the various distillates for 2 hours then treat for ½ hour with 20% KOH, & then add Excess of hot water —

220 is Reddish strong of H_2O Colored Red —

175 B-H_2O very Red oil light yellow —

253 is steel greenish & water Right reddish yellow very little action by KOH as this shows on the BP 1 it is in the greatest quantity & is probably the one we want as it is extremely difficult to act fure with naked flame

280 is colored deep red
+ H_2O light yellow

200 BP is Red + H_2O light
- Color (yellow) Cream. 280,

May 4th 1904 -

Have been distilling with
without KOH, Resin, asphalt
+ other things to get an oil
to fractionate. Cap distilling to
get a high BP oil but so far
nothing approaches the
high BP oils from Orlando

The BP 253 aprox is greenish
+ is very hard to set it on
fire. It works in 1/4 inch layer
on bottom OK. Lets spurts KOH
through but this can be
taken care of by valve

May 4 1904 7 a.m.

and Excessive foaming by Bone Black H.C.D. treated which stuck to the oil —

Distilled about 3 lbs of Rectified Oil Amber + am now redistilling + fractionating it to get the proper oil which I think is around 250 Cent. I find freezing point of oil also it does not solidify at Zero but gets thick — I don't believe there can be found an oil which is less Viscous at and temp + which has such high B.P + flash + fire of 280 Th + attack by KOH + has the properties it has for the purposes —

May 5 1904 T&E

Things to dissolve in 253 C Amber oil to change its nature to see if smaller quantity Camphor used. Also if possible to dispense with Bone black & take care of foaming without it -

Anthracene, Paraffine
Anthracene Orange - Base from
Mauveine, Abietin
Amarine, Quarione
Benzkin Benzoin Benzoline
Benfoot-Blue Betulin
Cyanthrene
Dolman Resin now used part.
Helenin Hydrobenzoin
Hydrocinnamide
Part of 9C1Ca Resin not sol KOH
Indigo Blue
Martubin Dibromonaphthalene
Hexachloronaphthalene
Oleocerin

Oxynaphthalamine
Palmitone
Oxanthracene
Bromophenyl
Tribromophenylamine
Cyanpline
Mononitrophenylamine
Pyrrol Red
Quinoidine
Styrylamine
phthenylanecenamide
Sulphobenzide
Oxythymol
Acenaphthene
Hydranisoin
Anthracene Hydride
Dibromoanthracene
Dichloroanthracene
Tetrachloroanthracene
Anthraquinone
Hexachlorobenzene
Sulphobenzide
Dibromotoluene

Sulpholobinda
Dibromoxylene
Monobromocamphor
Confirm boiled — Distinct resin micky
Acephallene
Pentabromonaphthalene
" Chloro "
Dibromonaphthyl
Dioxyresistine
Diacetyl-trichlorotoluhydroquinone
Benzalinido
Anthrachrysone
Chrysean
Azodiphenylblue. KOH greasy, base
Indulone-enzyme
Dibromoazobenzene
Tetrabromodiphenyl
Benzyl-ene-dinaphthalinido
Carbazol.
Conima or incense Resin
Dimethylanthraphthalein
Dibromofluorene
Ditolyl

Quinidine added to Amber Ord 170@190 in rather large granules dissolves by heat and causes a 1/64 bubble froth 1/2 inch+ prevents spitting. Think of proper amount used it could be got just right to produce say 1/16 froth + prevent spitting —

May 7 4 pm 1904

Experts with test Tubes with Reg tat Valves 6 Lamps -

No 1 Reg 21% KOH, Water 4.1/10
Oil 37/100 lbs - on 3.30. pm
May 8 / 11 am - KOH. 3 49/100 oil 37/100
test papers clean Refilled KOH 3 98/100
Notice a yellowish flocculent deposit floating 1/4" below oil.

No. 1 May 3.

Oil	Level of KOH	Paper	Valves
34/100	3. 87/100	4 specks ∴ Moist Clean	

Remarks Dark brown oily substance floating directly under oil.
Stopped current 8.00 A.M. Started 8.40 A.M.

No. 1 May 10

Oil	KOH	Paper	Valves
34/100	2.97/100	8 Specks	Clean moist

Refilled to original level
Stopped 8.00 AM Started 8.30 Reparrafined

No. 1. May 11

Oil	KOH	Paper	Valves
34/100	2.90/100	1 Big Blotch	Clean moist

received

Refilled to original level

Stopped 7.40 AM Started 8.00 A.M.

No 1 May 12

Oil	KOH	Paper	Valves
34/100	2.85/100	Clean	Clean moist

few Spots from edge of valve

Refilled to original level

Stopped 8.00 Started 8.30

May 13 Refilled 7.45 A.M.

No 2. Reg KOH. 4" May 7
340 pm - Water 4 1/10 oil
37/100 6 hrs mps
May 8 11 am - KOH, 38/100 - oil 36/100.
Test pump clean Refilled 4 8/100
Notice flocculent deposit floating just below oil in KOH.
No 2 May 9.

Oil	Level of KOH	Paper.	Valves
35/100	3. 93/100	Clean	Few drops of rust

Dark brown deposit directly under oil
paraffine hose, reassembled.
Stopped engine 8.0 AM Started 8.40 AM

No 2 May 10

Oil	KOH	Paper	Valves
37/100	2. 95/100	Clean	moist slight rust

Refilled to original level
Stopped 8.00 AM Started 8.30 Reassembled
No 2 May 11

Oil	KOH	Paper	Valves
33/100	2. 9/10	Clean	Clean moist

Refilled ~~to 3. 6/100~~ original level
Stopped 7.40 Started 8.00

No 2 May 12

Oil	K O 11	Paper	Valves
32/100	2 87/100	clean	clean moist

Refilled to original level
Stopped 8.00 started 8.30

Started Fresh same as before 2.10 PM May 12.
May 13 Refilled 7.45 a.m.

No 3, May 7 340pm —
KOH 4" Oil 57/100 -

Allowed KOH froth in regleat
2 mohair wicks and oil —
on 340 pm 6 Lamps -
May 8 11 am - KOH. 3 to Oil 55/100 -
Tank proper clean Refilled 3 84/100 - Clear.

No 3 May 9.

Oil	Level of KOH	Paper	Valves
59/100	3 70/100	Clean	Slight rust moist

Light yellow deposit directly under oil.
Stopped carburet 8.00 AM Started 8.40 AM.

No 3 May 10

Oil	KOH	Paper	Valves
54/100	2.90/100	6 spots	clean moist

Refilled to 3.60/00

Stopped 8.00 Started 8.30 Repair fixed
No 3 May 11

Oil	KOH	Paper	Valves
50/100	2.50/100	6 spots -	Clean moist

Refilled to ~~original level~~ 3.60/100
Stopped 7.40 Started 8.00

No 3 Main IR

Coil	Roll	Paper	Valves
50/100	2 55/100	~~5 spots~~ 2 spots	clean most

Refilled to original level
Stopped 5.00 Started 5.30
May 13 Refilled 7.45 A.M.

KOH - Although KOH.
3 2/10 KOH, Oil 42/100 -

Added piece Ammoniated Copper
3/16 dia at fall to bottom
dont appear dissolve or Color
but notice Black particles on
froth + it froths scarcely more
than Reg -
on 3.50 pm May 7 1904

May 8 10.50 am - KOH. 2.58/100 - Oil 42/100
test paper clear - Methyln apparently untouched
but dissolved Refilled KOH. 3.90/100 Clear

No 4 May 9
Oil Level KOH Paper Valves
44/100 3.75/100 Clear Slight Rust Most
Light brown deposit directly under oil
with one lump of foreign matter floating directly
under oil.
Stopped Current 8.00 A.M. Started 8.40 A.M.
Stopped 2.45 to repair leak through
Paraffine Started 2.48
Refilled to original level
Stopped 8.00 Started 8.30 Reparaffined

No 4 May 10

Coil	KOH	Paper	Valves
41/100	2.98/100	Clean	Clean moist

Refilled to original level
Stopped 8.00 A.M. Started 8.30 A.M.

No 4 May 11.

Coil	KOH	Paper	Valves
39/100	2.90/100	Clean	Clean moist

Refilled to original level
Stopped 7.40 Started 8.00

No 4 May 12

Coil	KOH	Paper	Valves
35/100	2.95/100	4 Spots large	Clean moist

Refilled to original level
Stopped 8.00 Started 8.30
May 13. Refilled 7.45. A.M.

No 5
May 11 3 oclock PM
Veil KOH
Castor 6 Lamps
$ 50/100 4.00/100

Distilled from solid caustic soda
solution yellow - distillation
blue distillate - purified coil
Weight original not given
Mein distilled 9. Thus is BP 220 to 260
at distillation in vac & Nacl
Works OK in coil - evap all right
in metal glass beaker
Still bright - oxygen apparently does
not oxidize & get valid value
Lamps - & this only pure coil
oxidized by Mn++ & alkaline permang
Reduced, works —
No KOH smoke comes off from
foaming of KOH treated coils
Bone B - 1/32 6 wks 6 Cov 1/8 to 3/16
Keeps in top ~~of column~~ Bone B++
don't work with it by Current
Lube C.P 160 @ 170 Kerosene

Thus seems OK —
No 5 May 12
Veil KOH Paper Valves
37/100 3 P 5/100 blown blown moist
Refilled to original level
Started 8.00 Started 8.30 Deposit
upon glass above coil colors brown
May 13 Refilled 7. H S. A. M.
Notice that the KOH solution in NO5 - is the
only one of the 7 coils that ~~is~~ is not
clear —

No 6 = Allbright KOH, Gad foamers.
Shaken Bone Blk – 200 to 210 BP
distillate from Crude Petrol
purified by H_2SO_4 Conc then washed
KOH + Bone Blk filtered –
OK test for cracking – fuzzis solid –
MacFar Tea –
45/100 Oil – 6 Lamps May 11 1904
630 pm –

No 6 May 12
Coil KOH Paper Valves
40/100 3.47/100 Clean Clean moist
Not refilled
May 13 Refilled 7.45 a.m.

No 7 - Albumenized Roff.
with CP Boneblack by HCP4
acid in rubber tube —
No Oil - at 1st it did not foam
but after running 1/2 hour
foams 3/8 — ON 6 pm - May 13 1904

May 17 1904

No 2 Due to Seven being leaky
abandoned them & started with
new Leaky Cells

No 8 Cell has KOH, highly
albuminized bathing 3 weeks
to 70 @C left them 250 Milgms
of the Reg dried bone blocks
I was had at Lab purified by
boiling 2 or 3 times in HCl
till I think nearly free of
ash when put in shaken 1/2
dozen times, when a test in
test tube showed no foaming
then CP BB seems to react
with lightning rapidity
think 100 Milgms would have
done as well — in No 8
I have the new heavy Valves
Later - while it did shake foam in
test tube it foamed in Vessel
Cell probably didn't shake enough
Connected Mon and 18½ - put over
clock in stopped it once

May 17 1907

No 9 - Call same as No 8
except Reg Valve + BB only
pumped once with HCP
not backed

Drew forward 1/4 inch this morning
18th - put dried stick in stopped
at once

No 10 – Albumen R.H. [illegible]
vest with Amber oil – after 14 hours
found it no forming – Wide Phenolt
[illegible]
[illegible]

It appears that Albumyd ROH which foams 3 inches in test tube scale has the foaming materially reduced to nothing by a blank test with fusel oil dropped in test tube, less powerful is ~~Compton~~ Amber Oil BP of high BP- Terpineol also no good next to Fusil- Whereas the petroleum distillates dont seem to work at all The whole idea of stopping foaming appears to be formation on surface of thin skin of non water soluble liquid on surface & this stuff must have property of not dissolving albumin it wont act & also it must not form bubbles of itself- fusel oil will not answer as it is too volatile it soon goes away & the foaming starts up- to inflammable Terpineol dittos Amber oil is inflammable so far that is practically non inflam & non evaporable & has the necessary property What is wanted is a liquid like Amber oil but having a good as fusel oil or cupfat-

I am going to dissolve different
rubbers in Amber 0 at high BP
Lima to see if I can get it

Dissolve Naphthalene, Stearic Ac,
Cerasin Bulks - rubber, Cannabis,
Asphalt Terpin hydrate, Carbolate Na
Anthraquinone Anthracene,
Rosin amber oil, Johnsdiffula
Camphor.

No 11 - Albumen KOH.
8 drops Fusil oil -
it foams 1/2 inch on starting -
1.30 am 17th = stopped foaming in
1/2 hour then at 5 pm I returned & found it foaming. I was just going to lift valve out & looked it & lifted it 1/16 when foam rushed & was inch high jumped & cork probably became dislodged & drops of fusil were dropped from valve & it immediately commenced foaming
at 530 put in 25 drops & will let it go till morning -
found it this morning 18 all foamed but the fusel having Evaporated some dissolved - I put in 1/8 inch of it = this quells foaming perfect
If we could get a non inflammable volatile oil to do as well it would be invaluable Can it be done; it looks hard? -
18th May 1904 ——

No 12 – 10 Drops amber acid
distant drop fouring sent in
addition 10 drops Final Acid
reduced it to 1/4 inch 2 pm 17th
May 1904 at 5.30 fouring small 1/8 in.

17th 1904

Lemia 225 BP purified
H_2SO_4 + KOH, ~~Bad~~ Dont work

Same with Little Rosin gives 1/8 foam after shaking test tube 16 drops
Thin is pretty good — around Edges there is some weak Rosin soap — Sol cloudy after shaking — there is something in this, its a soap former forgetting and Albumin former — like Cuno like may be

Cannabay with Lemia - dec by heat goes solid — cooled more oil made 10 drops sat sol. few drops foam 1/4 @ 3/8 ok - Sol. solid sluff also tube — No spitting — may be something in this foam quickly recedes to clear top filtered sol got it clear works OK 3/16 foam No spitting ? —
Recedes to clear top — This is going to be good — possibly can separate right thing from Cannabay — possibly want only the alcohol sol in it

Syrian asphalt + Luma 225 BP.
foam 1/2 inch, color permits one to see
where oil goes - part keeps all over the
foam + part — drops at water edge
Foam recedes quickly but not
perfectly when Cumene off —
It stops spitting perfectly
I added a few drops more the foam
is about 1/2 inch — perhaps above I
have more or less asphalt
Something in it? =
I would want still 1/2" all the foam
is colored may be oil + asphalt only

Stearate Na + Luma Neg —

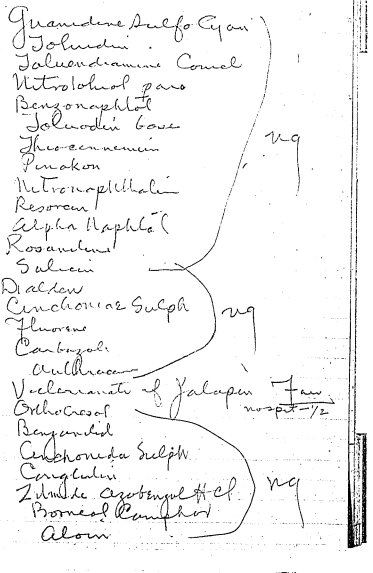
Methocene + Luma Neg

Cream + Luma Neg

Tried following with Lenna. High B.P. pinfound Jula & KOH

Butyl Chloral Hyd
Hyoscy Hydrob cum Acet
Cerebrondin Hcl
Agaracin
Diphenylamin
Piperine
Piperazin Hydrate
Papaverin
Nitro Anilin
Salicylate Morphia
Chinalin Tartrate
Jalap Resin
Quinidin
Turpentine Hcl
Naphthalene Alpha Dichloride
Ethylic Methane
Resin Copaiba balsam — This is fair
1/2" Foam stopping work it up
Procaine
Leptandrin
Santonin
Phenanthrene

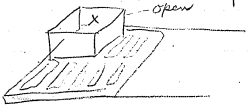
ng
ng
ng


Guanidine Sulfo Cyan
Toluidin
Toluendiamine Comel
Nitrotoluol para
Benzonaphtol
Toluidin Base
Thiocarnemin
Pinakon
Nitronaphthalin
Resorcin
Alpha Naphtol
Rosanilin
Salicin
Dialdan
Cinchonicar Sulph
Fluoren
Carbazol
Anthracen
Vedemante of Jalapin
Orthocresol
Benzaldol
Cinchonidin Sulph
Conglutin
Zimtsäure Azobenzyl
Bromcol Camphor
Alcon
Tan
no pt - 1/2
NaOH
NaOH
NaOH

Coffein
Dibrom-o-azobenzol
Ethylene Bromide
Trichlorbenzol
Benzidin
Chrysoidin
Benzophenal — Shows degrees
Acridin
Carbazol
Salicylsäure
Cinnamic acid
Dinitrobenzol

Mg.
Mg

July 25 1904 Experts on filling 7mm powder in pockets for Nickle Armstrong Bullet



X Open box filled with 7e powder block mx — Dragged over & back vibrating at right angles slightly to load fro mother —

6 Up kts —

3,910
4 310
4 410
4 650
4 600
4 650

July 25 1914—

Pressed 7c in hopper down vehicle over plating—noticed bad drag on one 2nd pocket—
over 4 back—last 3 got more pressing (1c) double plate—

3:870
4.040
5 100
5 00
4 420
4.830

On account of not having another plate beside the filling plate 1st plat don't get filled well—this time I worked box down 4 & 6 each reversal time over lapped to fill 1st plat giving plat a plate so filling plate by getting two plates—

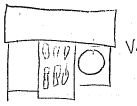
4350 5320
4750 5250
5080 5010

July 25 1904 28

Got Reg plate Gostwear hard smooth plates. used Round Cylinder 3/4 full 7c - 5 inch high worked it over plate in various motions several times —

4,750
5 020
5 100
5 250
5 380
5 130

Put plate this



Worked over Several times Varion Motion

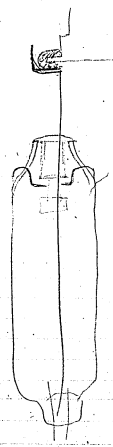
4,520
4 660
4 800
4 850
4 690
4,550.

Had to say much more in Cylinder.

26 July 1904

frost free cups with 1/8 overplus
& then roll 2" Roller over –
tried it lengthwise thus is result

6 005"
6 330
6 300
6 400
6 200
5 930



4.2
2.
6/10 62 61.
9/10

[ITEM FOUND IN BOOK]

Louis — Put these notes in Lab Note book date and sign it —

Compared with Reagent KOH

Potash picked Reagent

Bismuth Sub-Carb. same as good KOH

Magnesium Oxide " " " "

Strontium Carbonate Same about ¼ inch large bubbles

Cerous Ceric Oxide Slowly more than good KOH

Zinc Oxide same as regular KOH

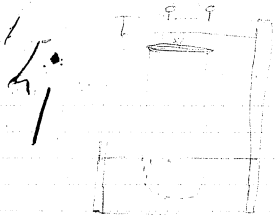
Zinc Phosphide Little little slower reg.

Mercury Oxide Slower not a little more than regular but big bubbles

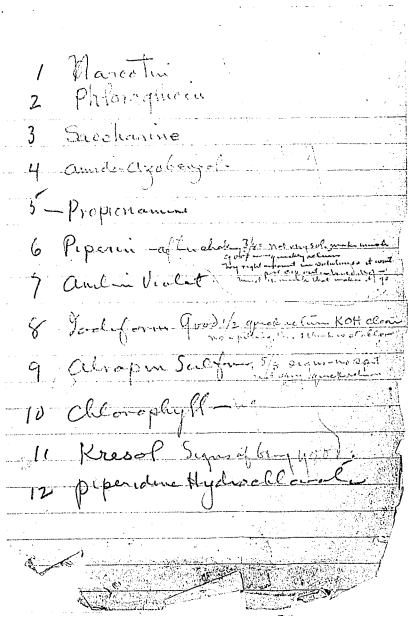
Magnesium Oxide same as regular

[ITEM FOUND IN BOOK]

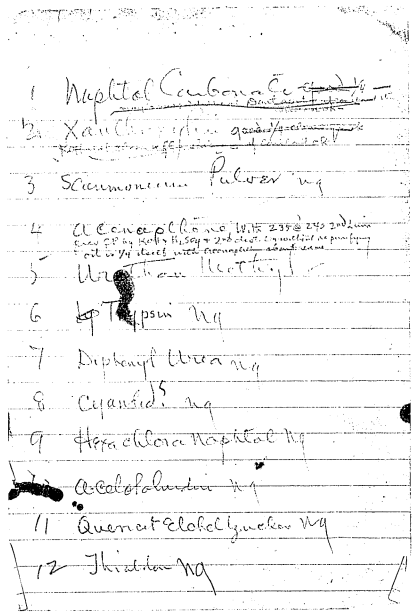
[ON BACK OF PRECEDING PAGE]



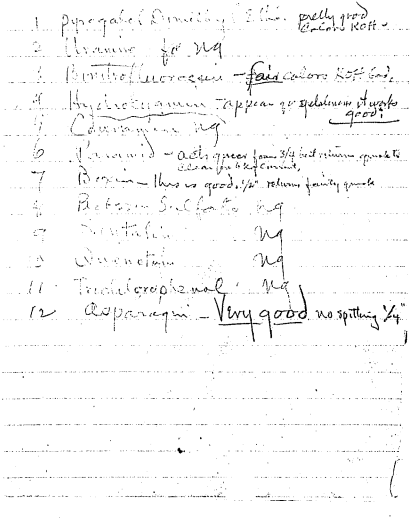
[ITEM FOUND IN BOOK]



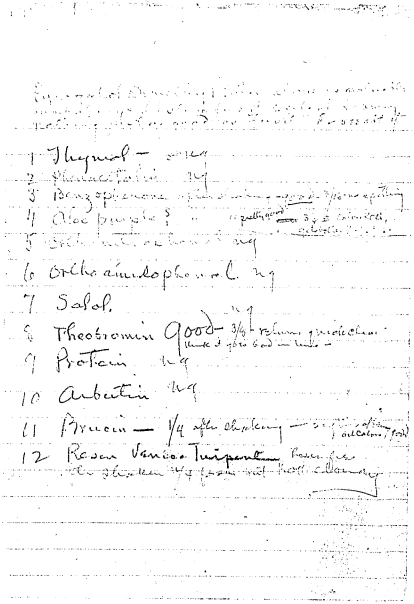
[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]



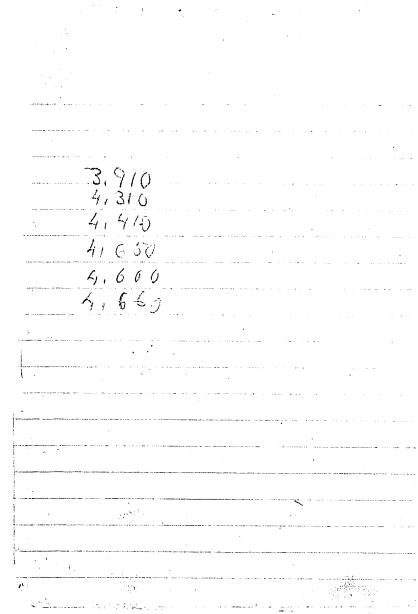
[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

1 Bruceu Sulphate.
2 Nitrate Urea
3 Antifebrin -
4 Antimalarin
5 Inulit
6 Beebarin Hcl -
7 Alanin -
8 Ortol
9 Cenchonidene
10 Orexin
11 Lactose
12 Dengamine -

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

1/ Linseed oil air-blown.
Potash neutral
Stops the foaming a little slower.

2/ Linseed oil treated with dilute warm H_2SO_4, KOH, - and filtered through bone-black.
Pot. neutral
Stops foaming a little slower.

3/ Linseed oil filtered through bone-black - as reg. 1. oil.

4/ Linseed oil chlorinated by Percheld. Phos. Pot. neutral
Stops foaming very slow.

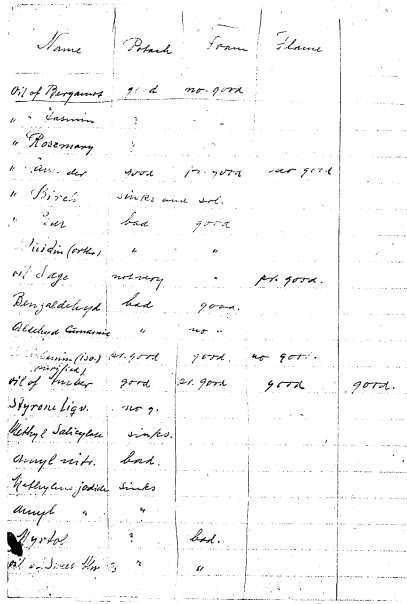
[ITEM FOUND IN BOOK]

5) Amber oil evaporated down a little in
an hot plate. Seems to be too
thick and foams ~~terribly~~ bad
Much Potash in the foam.
Does not prevent the foaming
in alkaline water KOH as good
as reg.
6) Amber oil evaporated Nr 2
Foams bad, Potash in the foam.
Seems to prevent the foaming in
al. Pot. better than nr. 5.
7) ~~Foaming~~ Amber oil Evapor. Nr. 3.
Foaming ~~very much a little more~~.
pretty bad. Pot. in the foam.
To prevent the foam in al. Pot.
are better than 5.
8) chlorinated Kerozene
Foaming good; Pot. not very good
does not prevent foam in al. Pot.

[ITEM FOUND IN BOOK]

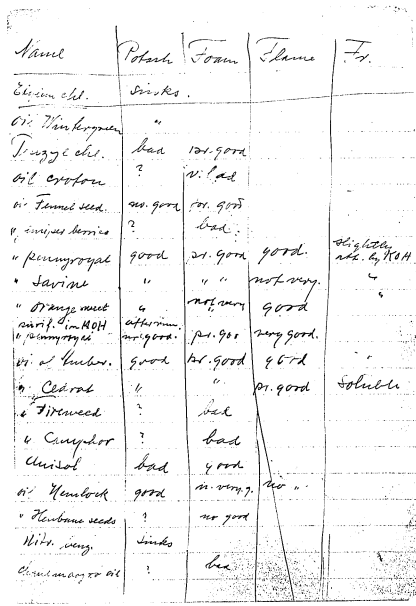
9. Distillate from gum Damar purified with KOH.
Foaming pr. good also Polarh.
Prevents the foaming in al. Pol
pr. good.
10. Linseed oil in hot KOH Yellow
Foam good. Pol. bad.
Does not prevent the foaming in al. Pol.
11. Terpineol
Foaming good Pol. good.
Does not prevent the foaming in
alc. KOH
12. Linsol. Foaming good.
Pol. no good. Does not prevent
foaming in alc. KOH.
13. Foaming good, Pol. pr. good
Does not prevent the foaming
in al. Pol.

[ITEM FOUND IN BOOK]



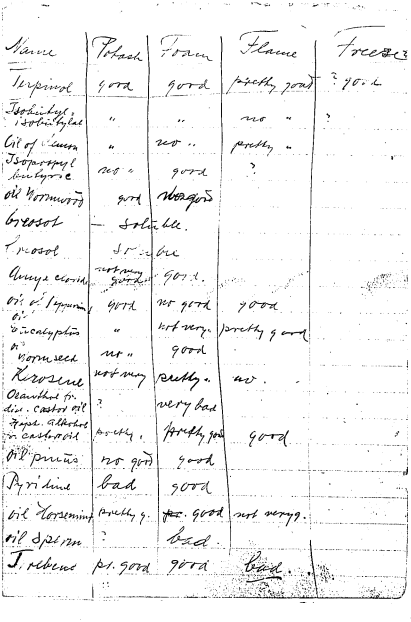
Name	Potash	Foam	Flame	
Oil of Bergamot	good	no good		
" Cassia				
" Rosemary				
" Cam. dec	good	[illegible] good	very good	
" Birch	sinks & sol.			
" Deer	bad	good		
" Cedar (Virg.)	"	"		
Oil Sage	not very		pl. good.	
Benzaldehyde	bad	good.		
Cedarwood Camphor	"	no "		
Cassia (No) purified	pl. good	good.	no good.	
Oil of Turpentine	good	pl. good	good	good.
Styrone liq.	no g.			
Methyl Salicylate	sinks.			
Amyl nitr.	bad.			
Methylene iodide	sinks			
Anise "	"			
Myrbol	?	bad.		
Oil of Sweet Flag	?	"		

[ITEM FOUND IN BOOK]



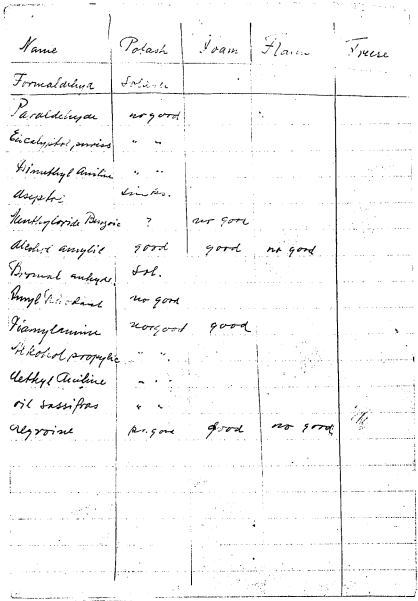
Name	Potash	Foam	Flame	Fr.
Cinnamon	Sinks.			
Oil Wintergreen	"			
Lemon Oil	bad	Int. good		
Oil Croton	?	V. bad		
Oil Fennel seed	mo. good	Int. good		
" Juniper berries	?	bad		
" Pennyroyal	good	Int. good	good.	Slightly sol. by KOH
" Savine	"	" "	not very.	"
" Orange sweet	"	not very	good	"
" Pennyroyal	after min.	very good.	very good.	
Oil of Amber.	good	Int. good	good	"
" Cedrat	"	"	Int. good	Soluble
" Fir wood	?	bad		
" Camphor	?	bad		
Anisol	bad	good		
Oil Hemlock	good	v. very g.	No "	
" Henbane seeds	?	no good		
Nitr. benz.	Sinks			
Cinnamon oil	?	bad		

[ITEM FOUND IN BOOK]



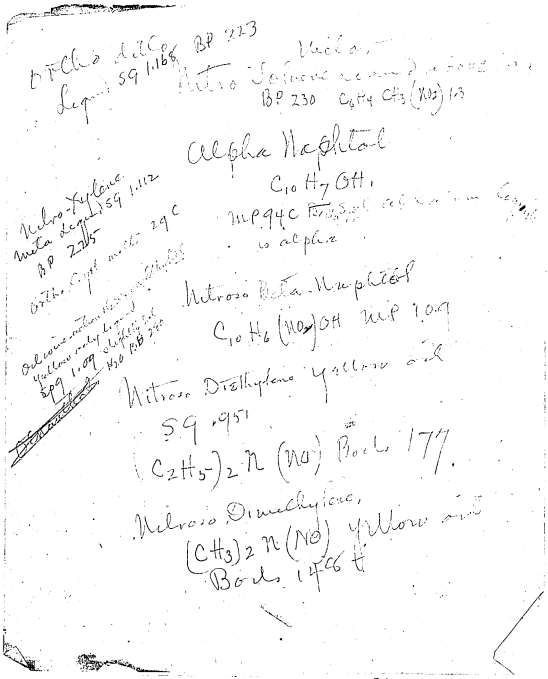
Name	Potash	Foam	Flame	Freeze
Terpinol	good	good	pretty good	? good
Isobutyl Isobutylate	"	"	no "	?
Oil of Cassia	"	no "	pretty "	
Isopropyl Isobutyrate	no "	good	?	
oil Wormwood	good	Nearly good		
Cresol	—	Soluble.		
Fenzol		Insoluble		
Amyl acetate	not very soluble	good.		
Oil of Lemon	good	not good	good	
Oil of Eucalyptus	"	not very	pretty good	
Oil Wormseed	no "	good		
Kerosene	not very	pretty.	no.	
Oil of Castor Oil	?	very bad		
Fusel Alcohol or Carbinol	pretty.	pretty good	good	
Oil pennies	no good	good		
Pyridine	bad	good		
Oil Horseming	pretty g.	not good	not very g.	
Oil Sperm	?	bad.		
I. Ethene	pr. good	good	bad.	

[ITEM FOUND IN BOOK]

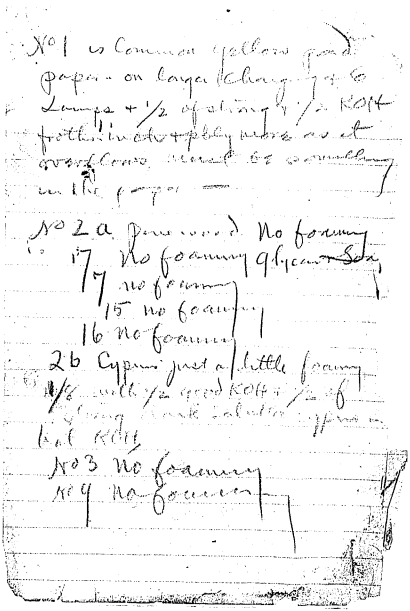


Name	Potash	Soam	Flame	Freeze
Formaldehyde	Soluble			
Paraldehyde	no good			
Diacetyltartaric anhydride	" "			
Dimethyl Aniline	" "			
Acetone	Soluble.			
Methylchloride Bromide	?	no good		
Alcohol amylic	good	good	no good	
Bromal anhydrous	Sol.			
Benzyl Chloride	no good			
Diamylamine	no good	good		
Dichlorhydrin propylic	" "			
Methyl Aniline	" "			
Oil Sassafras	" "			
Glycerine	no good	good	no good	

[ITEM FOUND IN BOOK]

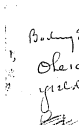


[ITEM FOUND IN BOOK]

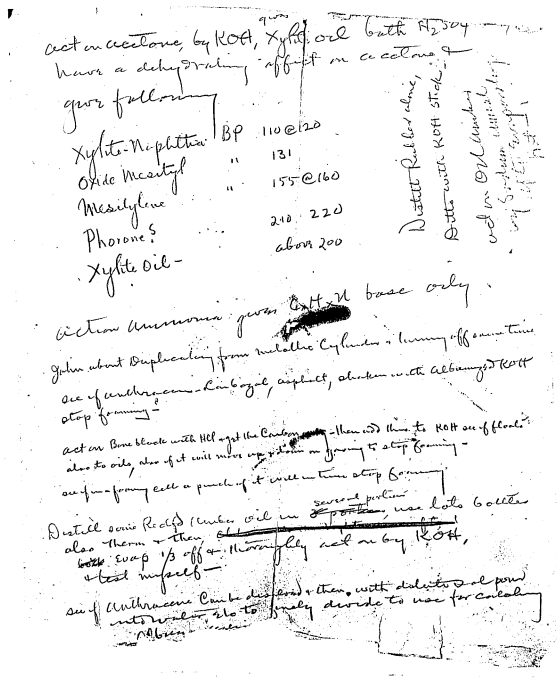

No 1 is Common yellow [illegible]
paper on large [illegible]
Lamps + 1/2 of plain [illegible] 1/2 Nott
[illegible]
[illegible]
in the paper —

No 2a [illegible] No foaming
17 No foaming [illegible]
17 no foaming
15 no foaming
16 no foaming
26 Cyprus just a little foaming
1/2 milk 1/2 good Nott 1/2 of
[illegible]
Nott
No 3 No foaming
No 4 no foaming

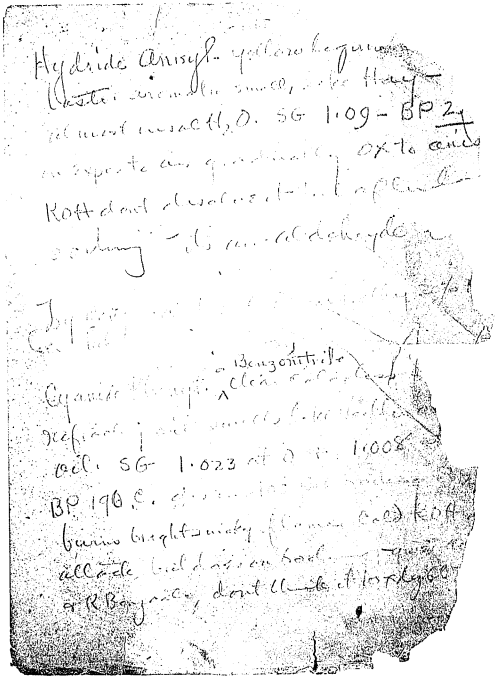
[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

Hydrides and [illegible] oxidizing
light petroleum, gasolene etc with
MnO_2 K Hypo, Nitric & Etc.)

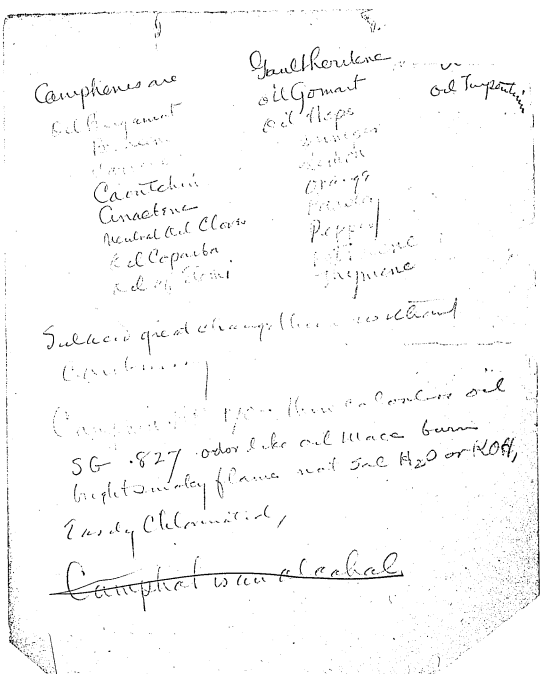
Amylbenzylene Ether – Amylate of Benzylene
Col – smell, Sol in oil, BP 292 C, S

Benzylic Alcohol, Benzene alcohol,
Toluylic alcohol,

Colorless, strongly refracting, pleasant
smell. SG 1.05 at 14 C 1.063 at 0 C,
BP 205.5 – sol H_2O

Benzylic Ether, Colorless oil BP 303 to 315 –
Ethyl-benzylic Ether. Chl benzyl distilled
[illegible] with alc KOH. a liquid separates from
KOH + mixed wi H_2O when separate 2 layers
the upper one dried [illegible] & part coming over at 180 C
dried over CaO & redistilled Collect [illegible]

[ITEM FOUND IN BOOK]



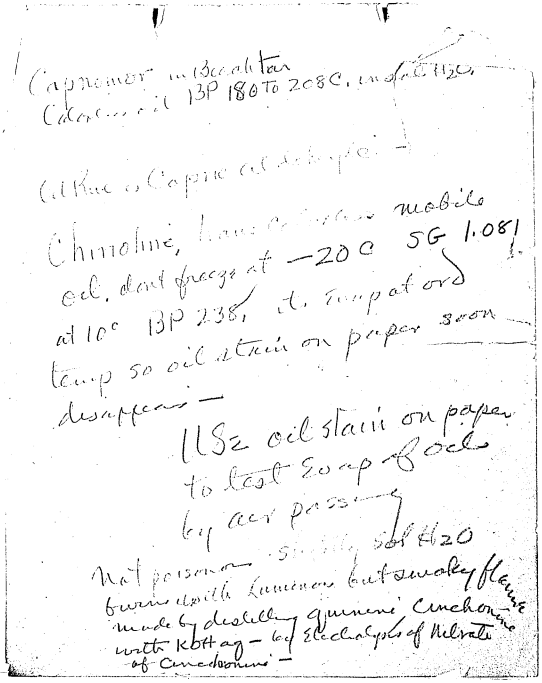
[ITEM FOUND IN BOOK]

Try Camphor alone on top of KOH in small cell,
also all the things tried previously
like Camphor oil,

Have all Ethers decomposed by KOH?

Camphor [illegible] molecular weight
color change — SG 0.984 BP 175 —
Rotation of —39°
Salt 2000 pts H_2O abs. 60 fm air
45 Values 14 days Converted to a Resin
it's not changed by KOH, - perhaps at
cond of run KOH.

[ITEM FOUND IN BOOK]

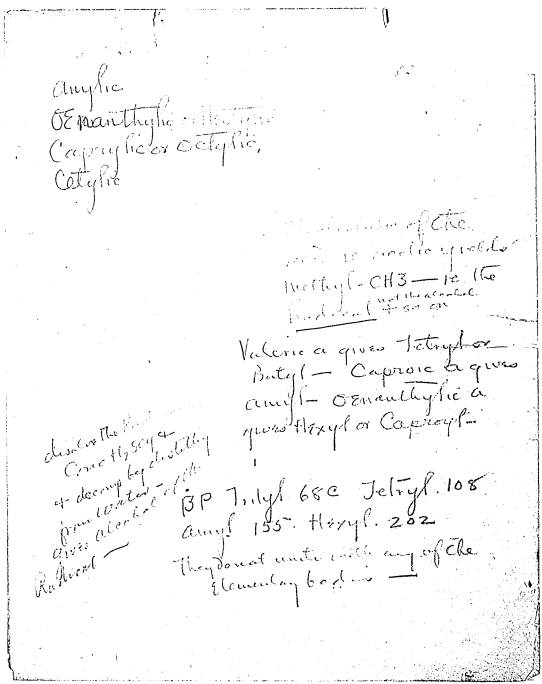


[ITEM FOUND IN BOOK]

Cinnamein, Cinnamate of Benzyl
Colorless oily [illegible] liquid at 12 To
[illegible] BP 305C, S
—15°
faint pleasant odor [illegible] water
grease spots on paper SG 1.098
[illegible] H_2O slowly absorbs
[illegible]
Moist Oxygen

Cinnamene, Cinnamol, Styrol, Volatile
oil liquid Storax, made by distil
Cinnamic acid [illegible] BP
Mobile Colorless oil, strong persistent
aromatic odor does not freeze at —20
its very volatile, grease spots on paper
disappear in few seconds SG 0.94.
BP 145 neutral, [illegible] not attacked KOH,

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

Heptylic a –
Recmolearic of K distilled high temp
gives Heptylic a Sebate K+H.

Ethal, w is Cetyl alcohol from Sperm oil
by Krafft – solid at

Ceryl alcohol, same way from Chinese Wax
& Myricyl alcohol (from Beeswax –

Benzyl alcohol. Hydrate of Benzyl
Cumyl-alcohol Hydrate of Cumyl-
Syceceryl-alcohol " " Syceceryl
Benzyl alcohol obtained by treating the aldehyde
(Bitter oil almonds) with alcoholic KOH.
& Cumyl-alcohol from Cumin same to Cuminol

[ITEM FOUND IN BOOK]

Cholesterin is an alcohol, ω

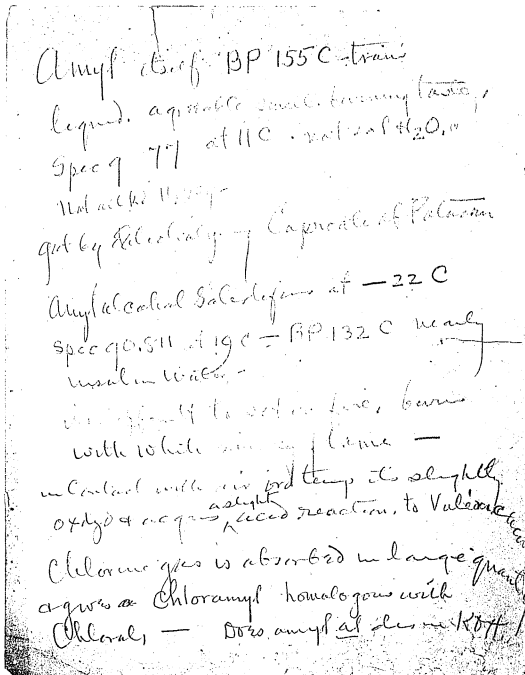
Styrone is an alcohol obtained by heating Styracin with KOH.

Saligenin is an alcohol.

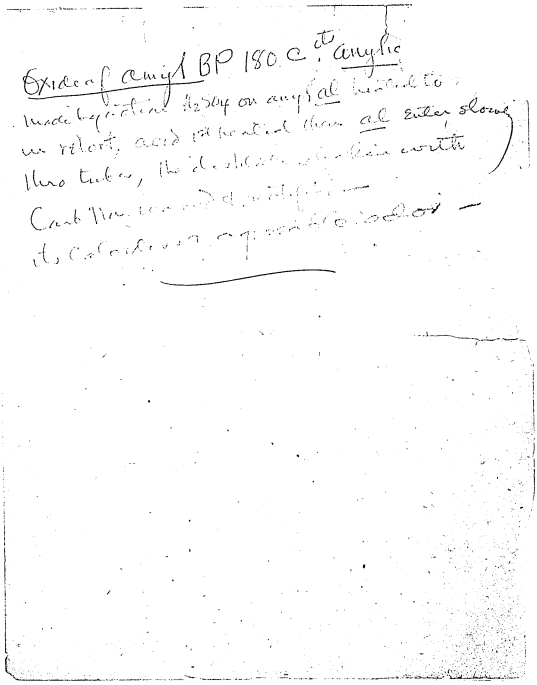
Anisic alcohol from ... by alcoholic KOH on Hydrate of Anisyl —

Ethylene-glycol or Hydrate of Ethylene is an al
propylene-glycol is an al
Butylene-glycol is an al
Amylene-glycol is " "
glycol is obtained by heating Iodide Ethylene with
recent Ag-quoy acetate of Ethylene —
by heating this with KOH gives Hydrate of Ethylin
only Exp.

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

4

String boiling KOH dissolve all oil of anise —

The Camphor got by chilling out the oil below 10C of heated water acid, Sulphate of Na - gives Methyl & Hydrin of anise —

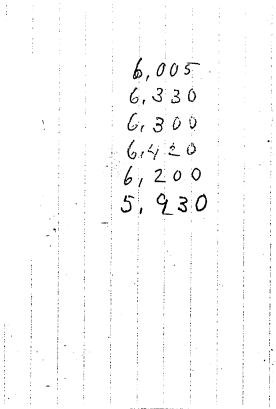
Prep up Chloromethyl ape —

Try with the oil formed [illegible] the tube with [illegible] foaming KOH — of 20% .

Anisol — used KOH, Calcium Mobiloil light pleasant smell, SG 0.991 — BP 152 C

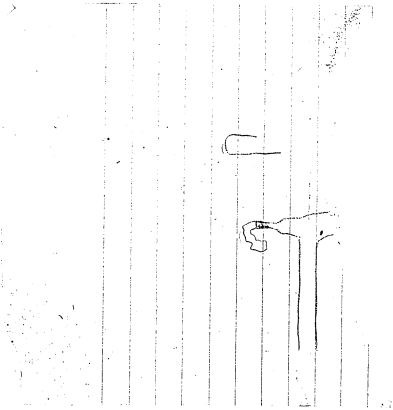
Get some pentachloride Sb for Chloromethyl

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]

[ON BACK OF PRECEDING PAGE]



Notebook, N-04-07-30

This notebook was used by Edison during July and November 1904. It contains notes and drawings regarding storage battery experiments. Included are items relating to the discharge of gas by the cells, the seals on the outer container of each cell, the loading of iron powder in the grid pockets, and the composition of the nickel used in the cells. The pages are unnumbered. Approximately 25 pages have been used.

N-040730
xE-172

N-04-07-30

July 30 1904 –

To test amount of Carbonic acid that gets through into KOH

Measure Content in cc

Make 12 + shelf with holders

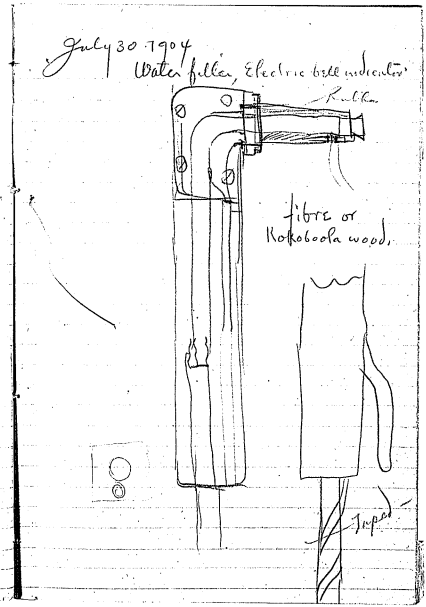
KOH 21%

1st Nothing in
2 Millon's Base 3 grams
3 " " 10 grams
4 Baryta saturated,
5 Bismuth hydrox
6 Magnesia hydrox
7 H_2O
8 – Ferrous hydrox
9 $Cd(OH)_2$
10 $Ce(OH)_3$
11 Nothing – to Check No 1
12 $Ni(OH)_2$
13 Only saturated & cut off Baryta with them $Ba(OH)_2$

Space to put Reagents in boat

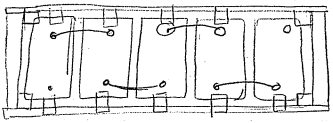
July 30 1904

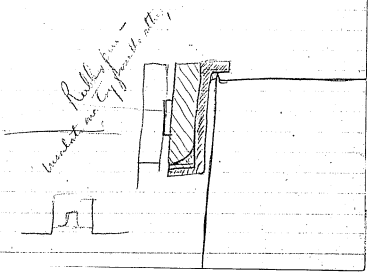
Water filler, Electric bell indicator



July 30 1904

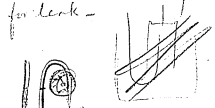
Rearrangement of tray
for bottles insulation





July 30 1904

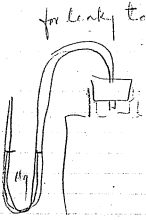
Hydrated Cane Sugar should be weighed in Water displaced by mercury for tank –



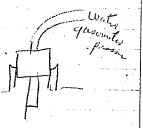
Hg

of furnished with filter Sucrose also loaded

for leaky top

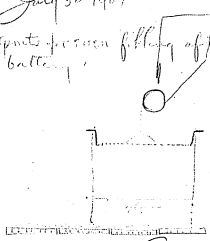


Hg



July 30 1904

Exposts process of filling of the pockets in 'baffle'



After assembling ~~Ethel~~ pass out they have a large projection. This is scraped off into a receptacle. There is a false plate ~~as~~ above the plate holding the pocket which is of brass & chamfered on edge ready to count additions as to weight of mix- the double plate after removal of compositions stuff + put in hand press & impressed until lower plate & false plate removed when ready delivered complete

July 30 1904

being placed over it a pressed by Prabin press to put the 2 pockets together to form the complete pocket.

Try Chromate K on albumen KOH
Exposed to light see if albumen
hardened by chromate on KOH,

See if Iodide of Hg changes its
Color in KOH

Rattray - Nov 26 1904

Group, Cups treated ready
Vapor [illegible] at H3 pressure
with [illegible] from Sulphuric on
Bone [illegible] Soak [illegible] 33% 121
25 for 5 cups 2 weeks

[illegible] cups treated
[illegible] 33% KOH 4 to 2 weeks
Use CP Solution & metal [illegible] no more

Group [illegible]

Group all CP Marked Cups
not washed

Group Reg Cups in Stock KOH, 33

Group in Marked CP 2 to KOH 33

" KOH from Sulfate

Group Madeleine Cups
" Removed perforations

Nov 26 1904

Group Molecules graphite Cannot

" Regulars in NaOH from metal
33% 21% —

Group Impurities Pg.

" " Regulars

Graphite [illegible] 50 [illegible] by
hydrogen - The Electrolyzed
in Solution of NaOH until get [illegible]
Capacity - Then will keep [illegible]
[illegible] by continuing -
Take look in gals Theory -#

Reduce Carbonate by Hydrogen
then fill in proper Nat Carbonate
in pores, dry & do it again until
all full) gas theory - use
low temp to keep from shrinking

Nov 26 1904

Make some Ni 6% exactly
Substitute with pure KHypochlorite,
Boil 2 evaporating, then Excess KOH to
Stop Evolving Gases —

Open one of the 120 hour Green Ni
mix of sticky - Solid, how far Black
See Exp 4to,

Boil some Green in 33, for 6 hours
at 250 - Filter Thru Chamb into 33 +
Wash with CP Water, Evap + make
Up wts, for Req run - Divide for Reverse
and grow for 120 hours soak —
Use CP duck, bumped up -
Notice often drying of Bulk is same —

Grow Req Rhyd 33/. little Nitrify in
Solution —

Nov 26 1904

Ascertain if the aluminum bursts iron or nickel —

Cup Runs.

Molasses, after thoroughly covered mix with ½ grams Mg Pyk. Then ship + put in, The M by H gives chance gas coming out,

For 120 hours soak —
grams 3. grms — 2.8 2.5 2.2
& 2 grms - Req —

Run Req group Cums on 21 long chge first & then 33/4 hour chge on group of 2 2.2 2.5 2.8. & 3.2 Reversed perforation Obt 2cc if constant per gram vent holes over thin Cups. OUN

Nov 26 1907

on long chg may be proportion to
mix but all 33/4 think output per gram
will increase on Capo Thinner –
possibly - 15% Cubic ft. of oxygen from good dry
mix duplicate 62 gas

Judging from the runs all round
Ni sanked 33½ 24 48 hours
+ on 2nd run gave 285 to V that
10% of graphite will not be absolutely
necessary but not to do as
well as 20% Ni alone 7+3 done
No bottle of Neal gas Expt
Thos Shanks has so far gas as the
limited –

Look at abs book where runs came
in 20% + 10% + get ½ of fall in
Capacity between 20 + 10 at hours
+ bar is at normal, think
fall very little at normal
temperature as I think coppery gas
20 was cause loss at high rate
knocks gas out of action, whereas at
normal Union still gas at low
etc slightly uneven 20% at high normal
+ 10 small " 20% at high rate after 29th runs
20 at high rate – 10 at high rate

Be sure you make the glucose
agar absorbed into Erlenmeyer
the 5% NH_4NO_3 dry mix of and soak
Use here after no water left
Blue: Repeat make a duty

Take 2 sterile 125 Erlenmeyer flasks and add 50 ml of sterile water to each. Add 0.5 g of dry mix to each flask. Swirl to dissolve. Label one flask "Control" and the other "Test". Add 0.5 g of dry mix to the "Test" flask. Swirl to dissolve. Label one flask "Control" and the other "Test". Add 0.5 g of dry mix to the "Test" flask. Swirl to dissolve.

Take another 125 Erlenmeyer flask and add 50 ml of sterile water. Add 0.5 g of dry mix. Swirl to dissolve. Label the flask "Control". Add 0.5 g of dry mix to the "Control" flask. Swirl to dissolve. Label the flask "Test". Add 0.5 g of dry mix to the "Test" flask. Swirl to dissolve.

Nov 29 1907

Possibly the passage of flat
swelling by long running and
closing by breaking [illegible]
Lake Albuminous hydroxide etc
so that next relay of these gas
Keeping [illegible] and digestion
is [illegible] Reverse
Cause High Impedance [illegible]
[illegible]

Seed [illegible] group of
Grain 151 soaked 33⅓ [illegible]
'24 hours in Chem Changed
33⅓ 150 Fahr. 15 hours 100
Ilm put 214 Chg 200 Rah
dur Chg 100 ——

Reverse the 6 and 12 Columns.
Ps heat 150 15 hours see if
[illegible] of Rack — 1st Run at
Reg in new ROH & if it short
Come back in 2 hours then
Reverse it

Nov 29 1904

When the Mechanic grumpus run first reverse Rotation in 21% 100 ratio, 125 deg to get best mechanism, The old book showed that with 9 Cycles the reversed run was 9% in Increment Ing —

We shaved by some grass delay dwindled to permit where the yellow started vertical graphite 3:12 smoked 33% 48 Watts + also welded 50 ak —

Try make a grump crumpus & corrugated vertical pulling sea-ed by any pressure on Nuy, Think 1/2 tons and Nuy 4 bad also Corrugated possibly Con Corrugated Cupt first, Mean full of use Special Crump —

Nov 29 1904

Wake 2d03

The nine curves with packets pressed various pressures — also their packets — also their packets grown soaked 33½ 48 hours put them up with Rubber Tops & both fastened together

look at Curves of Grown-after Cannot get Higher output Try only Electricity to 120 for Colpoteurs — Also try Electricity Feed wire to get internal Resistance

Try Group where grid put in for Electrolyte in use wire Solution NH_4Cl + NH_4OH — then in KOH & then Water Then dried; Then looks as though together also on grown — There may be good deal in these as $PbSO_4$ looks Lead Ox together in Lead battery by varying strength look very packed together + too hard Contract & breaking apart.

Nov 29 1904

Can try powdered green and see if can be leached
Together with Ca or Ba ions.
Try other KH salts + Something on the
Colloidal by dialyzing with water +

Take a Rag + dissolve it in small cell
1" apart from 1 hour then 1/2 then 1/4
1/8 1/16 - get Resistance then slowly
Can move it when about 1/2 way
along the dissolving + get all the
resistance in 2 minutes, Wrong can
do it,

Alumina is precip from KOH, by
passing CO_2 thru till KOH is Carbonated
= perhaps CaO Carb with quicklime Ca
go way get KOH free of Al -

Thus Locking together of the green
particles by a Solvent Like NH_3 CO_2
+ KH, etc may be just the clue
possibly the reason why the green
works brilliant green when soaked
33% host 48 hours is that it

Nov 29 1904

Softens + makes better Contrast + possibly this reason why Carb Uthy in old Exports expensed improves Bells ≠ by different Meshes -

Possibly Reg 9.33 w 78 mesh + Even 30, 62 always with this mesh. put in Cup + pressed well on dry on lock by Clam + rotated Cup as Clamp to —

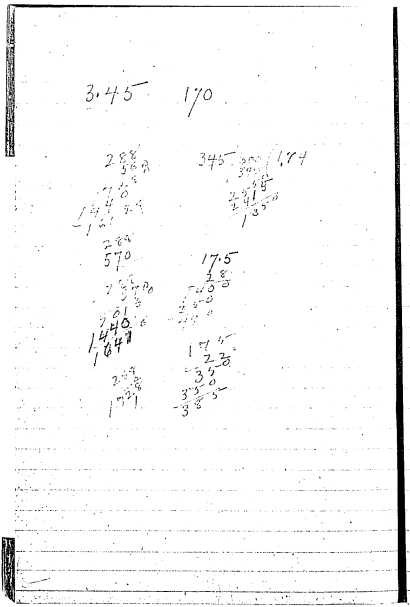
Cut

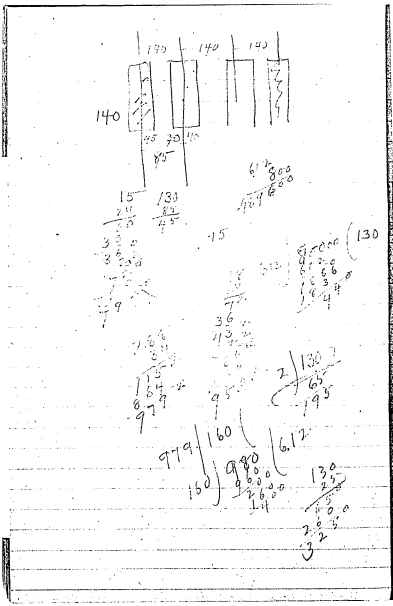
Make groups Reg to 62 run with Iron no Hg in it.
Make vari run plunder with groups.

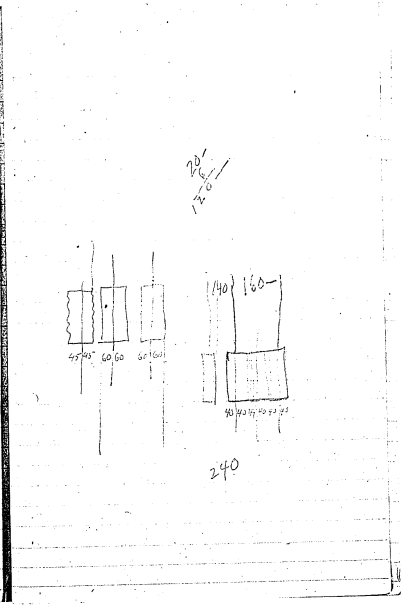
Reg up another test Room + put on another group

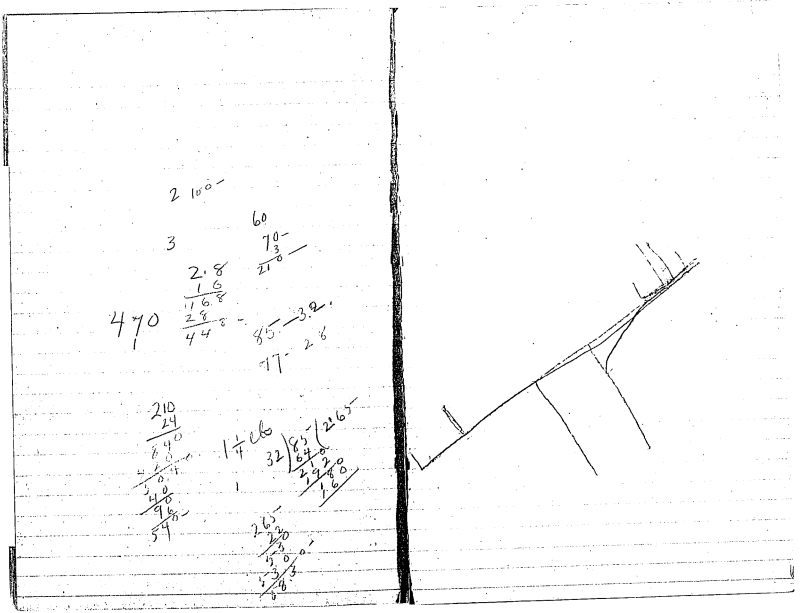
Looking together try weak
$NiCl_2$ $NiSO_4$ - $Ni(NO_3)_2$ Ni acetate
dry ether KOH ~~[illegible]~~ warm also cold
then dry 225— also Ca chloride
of NH_3 Al NH_4Cl - CO_2 Still [illegible]
Def ammonia Ni also Nitrate —

Ent



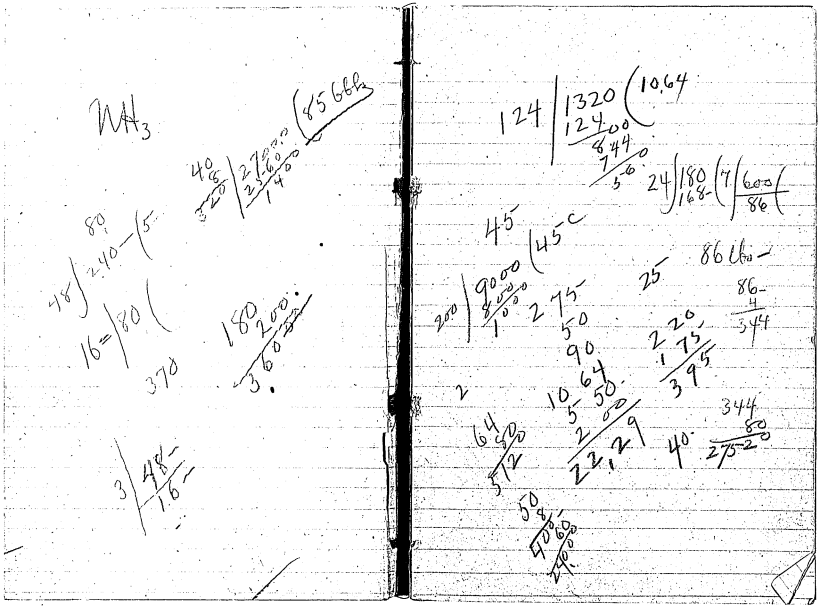


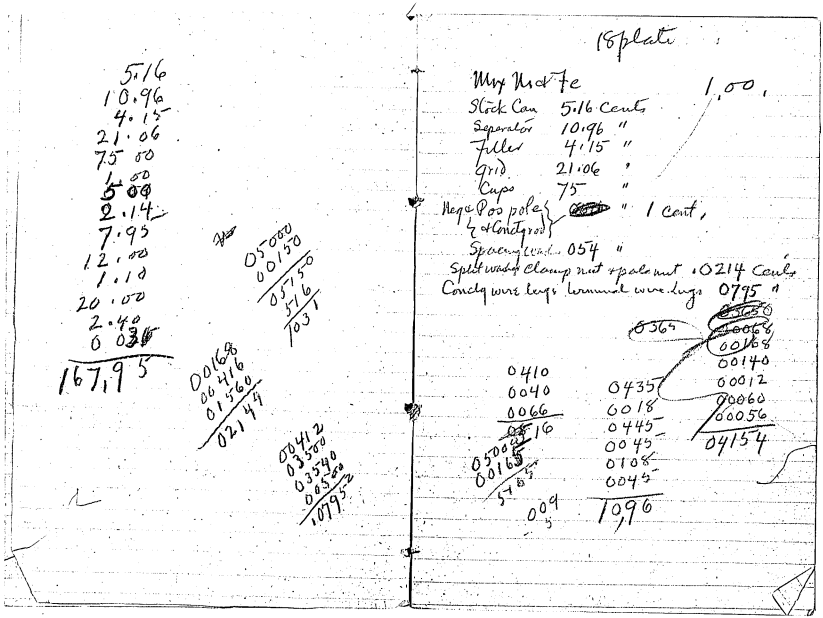

240

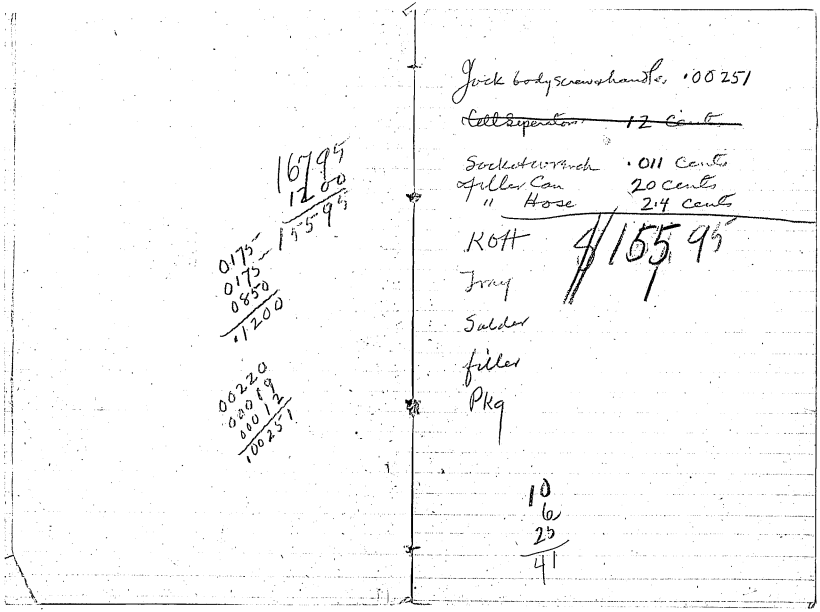


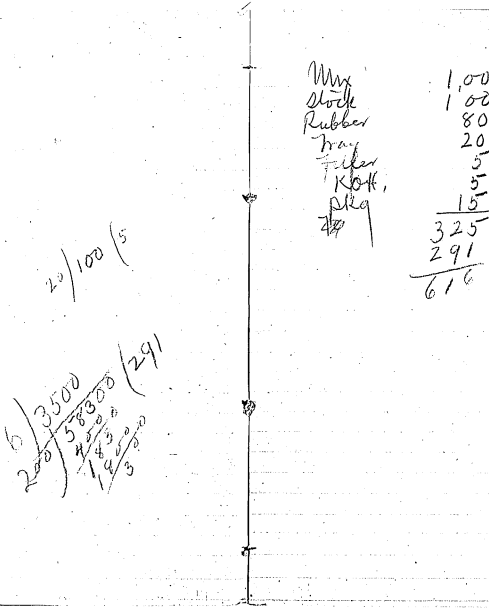
Notebook, N-04-10-15

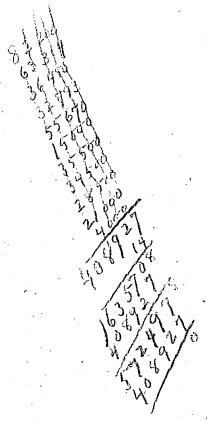
This notebook was used by Edison during October 1904. The book contains notes and drawings regarding storage batteries. Included is a list of possible causes for the loss of capacity by the cells. Also included are cost calculations for production of the battery and schematic drawings of the manufacturing layout. The pages are unnumbered. Approximately 40 pages have been used.




5.16
10.96
4.15
21.06
7.50
.50
5.00
2.14
7.95
12.00
1.10
20.00
2.40
0 .03
167.95
.05000
.00150
.05150
5.16
.103
.00168
.00416
.01560
.02144
.00412
.03500
.03540
.00580
.01075
18 plate
Mtg Metal 1.00,
Stock Can 5.16 Cents
Separator 10.96 "
Filler 4.15 "
Grid 21.06 "
Cups .75 "
Neg & Pos pole & Cond rod " 1 Cent,
Spacing Washer .054 "
Split washer Clamp nut & pal nut .0214 Cents
Cond wire legs terminal wire lugs .0795 "
.0364
.00168
.00140
.00012
.00060
.00056
.04154
.0410
.0040
.0066
.0016
.05005
.00165
.009
.0435
.0018
.0445
.0045
.0108
.0045
1.096


Jack body screw handle .00251
Cut Superior 12 Cents
Socket wrench .011 Cents
Filler Can 20 cents
" Hose 2.4 cents
KOH
Iron
Solder
filler
Pkg
$1.55 95
16795
1200
15595
0175
0175
0850
1200
00220
00019
00012
00251
10
16
25
41


Mfg
Stock
Rubber
Tray
Fiber
Kork
Pkg
1,00,
100
80
20
5
5
15
325
291
616
20/100 (5
6) 3500 (291
200
5800
4800
1000
3



408927
50

Skm 8178
10cksm 4089
2018
2018
16253

57,249
40 89 27
2 | 16 35 78
2 | 8 17 39
| 4 0 3 5
| 1 6

E 45

Theories as to the reasons

Why a set of cells all of which test high will after 2 months use show great changes in ampere capacity

1st Plates are so close that vibrating contacts take place while charging so they do not get full charge possibly same occurs to lesser extent on discharge - possibly excessive gasing working explosively (IE) in gusts or big bubbles vibrates the plates + make momentary Contacts. To detect these vibrations listen by a Stethoscope placed on side of Can - 2nd way shunt a cell with high resistance primary & listen with Telephone in secondary to hear sizzling of Contacts

2nd As there is considerable graphite on outside of plates in the perforations which was off-This graphite may by gas boiling make momentary contacts. across the bottom rubber or where the plates have got very close together the graphite going to the top + then subsiding worked in time fell up a pair off pocket that was very close + while not making an arc would make a high resistance short circuit The Original preliminary washing of the cells does not remove this graphite from the perforations — Perhaps there may be other places where the graphite flakes can build over — By listening to telephone or stethoscope, or in a very dark room + high charge could when top was taken off look down for sparks — but in case of high resistance circuit this would not show —

3 = Mercury iron filiments by Electro deposition grow across cells — this was found in one cell taken apart, None found

4th Iron dissolved in the KOH may get sulphurized on the surface of the Rubber + Conduct — Lead foil is used to polish rubber possibly Sulphur acts to make it a conductor or it becomes peroxide of lead and makes high resistance circuits,
Chemical Rubbers - did not spot

5 Are the E45 from Gibbs wagon got rubber sap between the nickels —
Was Ni filled before or after was got even filled plate. — often

7 To prove cross or high resistance: One E 45 showed bad taken apart washed + assembled as two E 18 putting all the low cells in one Cell a high cell in the other

8= also one 2 45 ohmed have KOH poured half out + balance shook up to dislodge + wash out any graphite particles that became lodged Electrodes + this poured out + new KOH put in + chgd 24 + clrs — dubious-good

9 another cell showed heavy KOH poured out + distilled water put in + soaked couple hours + poured out + this kept up. till water poured out showed I calcaly any KOH then had 6 cells for Resistance with no water in + there is a conductive graphite arc we will catch it —

10= possibly can see through the filler hole in the dark of sparks given off under liquid —

11= Uneven crimping & the gradual swell after 1st test has caused bad contacts with nickel-
As rewired cells came back this might be so

12 = Cells which are now low perhaps My parties permitted Water get low in these cells and when has heated & driven Hg Out & iron is low
Iron tested out good

13 = Rubber unequally treated & More Sulphur in one than another Cells in time this comes out & affects the iron = Grow OK

14 = foaming of cell causes float graphite to go up against shield shorting this can & plastered over so Earth giving a high Res circuit This may be Cause of exploding some cells possibly

15= The swelling of the Edges of pockets is very unequal - if they hold well the swell is small if they do not hold well the swelling is great + this variation of swelling must have a powerful influence on the Contact with the Mix along the Whole face — if the Edge holds the mix there is forced out to the Center + the Center swells — if the Edge dont hold well there is a slip + if on one side that side gets a poor Contact therefore the Crimp shows hold — possibly the failure to hold is due to shallow inside cuts —

6= The nut on top call (me) the rubber has a lead surface I think — possibly high Resistance here —

possibly

7- Possibly water gets low — ROH Concentrates at bottom of cell swelling lower pockets (10) lower ends of each pocket all way up so there is a bad contact on mix —

NO.

8 Will reversing the method bring a bad cell back — Possibly in many cases Reversing with battery current only dislodges flakes of graphite between swelled pockets removes high resistance short ckts — or globules of Hg just on verge + which explode —

Saw long globule Hg + stuff at bottom old cell dangerously near bottom plates

Reversing at factory to clean will stop this —

Making Can by plating

1st Make plaster pans small can's size varnish with asphaltum Bengal aqua fortis & put in Rufus plater

2nd Make thin brass cell 5/1000 solder it & plate over & deposit removes brass by evaporating

3rd Make an Exp[eriment] of pouring lead in a brass cup & quickly pour it out see if shells do also get some type metal try & make Cell possible Mixed tinsue type metal also possibly Zinc Fusible Metal etc. Analysis —

~~possible Fusible Metal deposited~~ ~~dep~~ ~~type metal~~

Citrate a gram
when ~~[illegible]~~ in specimen

Citric a Vm Sal alcohol

phthalic a "

Mtyl pdy suffciently
Sal alt

Mtyl NO3 Sal al

Benzoic acid

Bichromate K sol al-

Camphor,

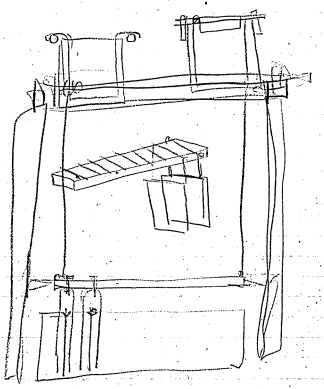
Naphthalene in Benzol-

Oct 28 1904

Think the MoO4 dry can be soaked in water & then put in tumbling bbl. graphite put in without any of the graphite coming coated with Mo

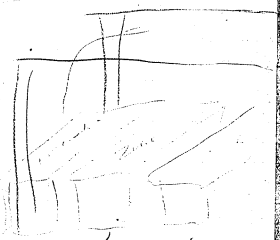
Possibly MoO4, 60 mesh sand put in tumbling bbl with Ammonia ~~Vapor~~ Vapor passing in ~~with~~ with the graphite coated with Cond. sulfur Nickel to stick to graphite OK -

perhaps tapping up screws on connecting tanks filling & Cosmos like Cells to stand Ckt, see Mallory



60 - 40

160 -



20 cl. 6 5 4

14

100 / 2500 (17

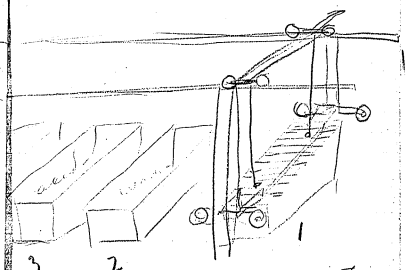
50 [illegible] —

4 Jankoystems.

8 men —

4 Sets

2 keys



3 2 1

1 operation

26 minutes

48 in 24 hours

1 - 150

2 240

3 480

4 240

5 150

6 150

7 — 150

1560

60 / 1560 (26

120

360

#2 6th =

$$\begin{array}{r} 23\frac{9}{16} \\ 30\overline{)719} \end{array}$$

$\frac{31}{32}$
$\frac{63}{64}$

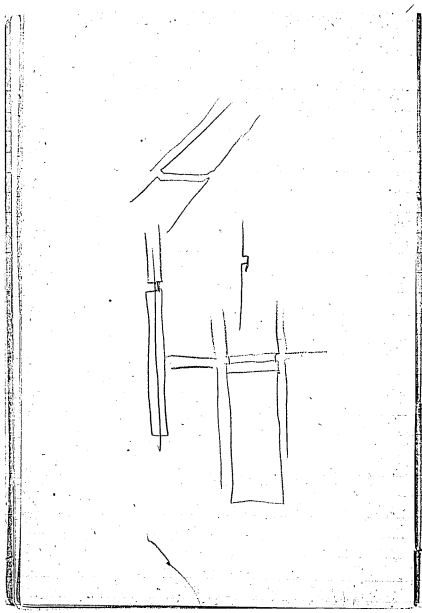
$$30\overline{)446}\ (1$$

#1.

100. 5 days $\frac{1}{1000}$ =

~~5 days~~ or 1 ft. $\frac{1}{10}$ mile

$$144\ \overline{)\ 14.4}\ (4.\ \text{Ans}$$



150 dips
2.5 cc to produce 1 dip

150 dips
25
750
300
375 cc

200 cc

1200 cc

20 pkts 1 lb sugar cube - 150
1/8 - products 1 lb
30 milg to dip
86 dip
10 hrs - 30 / 2 cc / 86
240
20 - pkts 1 sugar
180 / 1/8 / 20
1728 / 27
446000
125
2230000
892000
4460000
557500
5500 milg
180 / 5500 / 30.
540
1100

Experiments on Battery

Oct 15 1904

1 = Make Iron with 20% (30 to 40 to 50%) Copper (metallic) + Req amount of Hg — First make iron then Copper ammonuated, then wash + dry then mix HgO — & make variations as to amount of Copper — also try instead of Copper use Bismuth Oxide & HgO, mixed with the Iron — also vary this, The idea being to have the Copper or Bi. hold the Hg in place as an amalgam working Fe as oxide + thus give a good Contact for last remenants of the metallic iron — (Vary the Hg)

2 = Carry heat higher + reduce the iron to bright non pyrophoric state using HgO in mixture Req amount /

3 = Try an old Ni that has gone bad - dry
Hot press with thick rubber to
make cup hug the irregularities
of the Ni + allow for only good
Contact back —

4 = Make an iron with 20% B_2OH
mixed with it moistened HgO —

5 = Make iron by heating Ferrous
Sulphate with Menthol KOH.
Reduce H, Reg + high to get
iron pyro iron — ~~Make~~ with a dab of
HgO to get Voltage to see if KOH
removes any impurity that gives
high Voltage and Charge
also treat the Oxide after
washing with Hydr also
with purified Nitrate KOH to
get Manganese out

6 = Make some Iron by Electrolysis from Ferrous Sul + Nitty - Nat same as Rafn uses get 1/2 lb — then dissolve in CP Sulphuric + replate at lowest density possible just so iron deposited and no metal higher in the series - then dissolve in Sulphuric CP + form Oxalate ignite + Red by H Reg use Hg + weld and, by using a very low density can remove most of Manganese + Cerium,

7 = Make a iron amalgam by the Current then agitate with air to Oxidize the Manganese + Cerium + metals Wash them the iron + distill the Hg in Vacuo also air + oxdy if necessary by Hypo —

8 = Has the H_2O_2 anything to do with high charging V. Using H_2O_2 being used in KOH —

9 = ~~Take~~ charge a small cell in Reg KOH & instantly remove to 45% KOH & discharge —

10 Chg small cell in 5% & instantly remove to 45 per cent & discharge - These Experiments showed gave some clue to Voltages due to Concentration

11 = Charge small cell in 45% & instantly Charge & discharge in Reg 20% —

12 = Make some indurance cells with new die with short pocket,

13 Both Reg pockets but after final Corrugation press with Rubber at higher pressure than Corrug or plain press to make just of pocket follow contour of the nickel screen

14= In a test cell charge and at same time add + connect to the 7c Elec a large surface of plain cup to see if larger plain surface increases the charging voltage, also when it is sulphuted —

15 Calyhzers to mix with Iron
Using Hg + possibly Copper – Cobalt Hydrox
Cerium – Cadmium, Bismuth, Silver, Cobalt
Platinum, Tin, Antimony + Lithium, Nickel, Nickel Hydrox
Carbon, Silicon
In Electrolyte Zinc Tin Sb, Lead
Aluminum, Li Na Cl, Br, NH4 as KSCN
Magnesium Hydroxide, Bismuth hydroxide
Ba Ca, Sr, Tellurium, Arsenic, Selenium
SO4 – & other stable acid radicals —

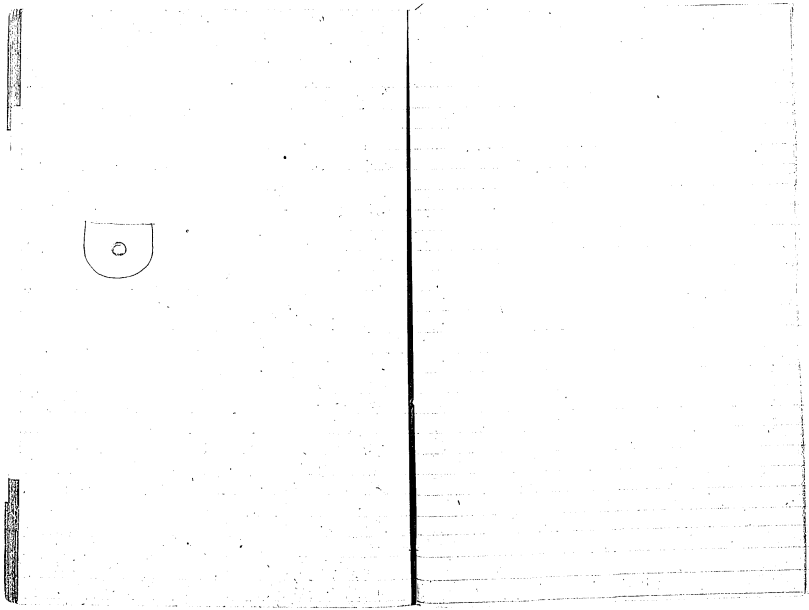
16= Find out make a good pocket with dry Thin Calliper for iron using 1.4 iron instead of 4.8 to see if circulation is better + Charging Voltage better,

17/ Use porous partition + put Ni in 40% KOH + Fe in 1% KOH + charge + get voltage Curves — Then Reverse the operation, Chge in above + disch Ni in 1% + Fe in 40% — also charge Ni in 1% + Fe in 40 to see what Can the changes be the place —

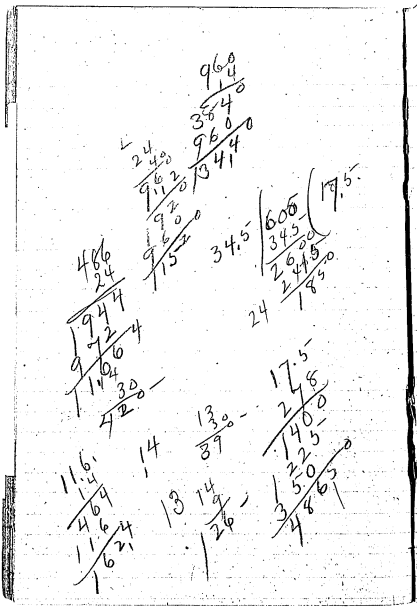
18- Charge + disch Reg Little Cell in 5% another 10% another 15% — another 25 another 30% another 35% + one at 45% to see Chg + disch Curves —

19- Do the same in NaOH,

20- Do the Same as 18 with 2 parts Chlorides K in of the percent of KOH — ditto 4 parts —



1= Soak group hot distilled H_2O (afterwaring Record) prep.
2 = get ½ dry Globbs ebonite—Grind (KOH or Alkali) just under
3 drying Rag Record prep—Boil in 1½ KOH 15 hours
4 = The 1st group pour cold bath (water boil KOH out
+ boil 2½ changes again, then 3 changes 12 hours part each
5 = Acetic uncompressed check Chromic Graphite,
6 = Clay in Aqua then weak boil MnO_2 Crude, same day
7 = well wash group Fibre pkts, put in Rag Cups —
Both Groups in Record Cups 2 —
8 Rem group in saturated Barium Cl, Then change to 2½ —
9 = Rem group in 2 grms Colalin —
10 " 2 " Albumen —
11 Reduce some Fibre in KOH with Hypersulphite K or Na Standing
granules — also in NH_4HCl dec of chloralum left —
also in weak acid — etc —
11 = group with C cups Recovered,
12 " " " with 3 grms Albumen —
to see if 1st clay bad.
13 group with 3 grms Sulphite K or Na
14 " " 3 " Tartaric Acid
15 " " 3 Molasses
16 " " 3 Sugar
17 " " 3 Oxalic Acid —
18 " some Hard Rubber $\frac{1}{32}$ Dg H_2O_2 also Hcl & Chromite,



Notebook, N-04-10-16

This notebook covers the period October-December 1904. It contains notes and drawings by Edison regarding storage batteries. Included is a twenty-nine-item list entitled "Experiments on Battery for ESBCo," followed by observations drawn from the results of endurance tests performed at the Silver Lake plant and from the examination of cells used in a Studebaker electric vehicle. Also included are entries regarding defects in the batteries and outlining possible causes for the loss of cell capacity. Inserted into the book are several pages of notes by Edison and an unidentified experimenter concerning the battery tests. The front cover is marked "T.A.E. Observations & Theories." The pages are unnumbered. Approximately 80 pages have been used.

X E-172 N-04-10-16

October 16 1904
Experiments on Battery for ESB Co—

1- Mix with Fe a the dope a little Coll. d.
Ferrichydroxide—

2= Use in ROH Electrolyte, Niobate K—
Tantalate K— Borowolframate K—
Phosphomolybdate K— Phosphotungstate K.
~~Silver~~ Trichloroacetate K

3 Precip Bi & Fe salts various proportions
wash free basic salts reduce by H no H_2O

4 Precip Hg & Fe formsalts wash free basic salts
Do not reduce by H. Try various proportions

5 Precip Copper & Fe salts - no H_2O —
Dont reduce by H. Try various proportions

6 = Precip. Copper Fe + Hg Salts wash free basic dont reduce by H — Try various proportions'

7 Precip Fe same way as we now make NaOH, use 7 & 3 graphite + grind same way $NaHgO_2$ test for Econ + permanency

8 Precip Fe Bi + Hg Salts wash free basic dont reduce by H, Try various proportions'

9 = Fe + Bi precip from salts various precips no Hg use NaOH Electrolyte as Na gives amalgam with Bi Heat Benzol decompose

10 — Small ordinance Cells 3 each Regular pressure on Corrugating 3 i — 3 with increased pressure + 3 with Maximum pressure permissable commercially

11= Test cell always kept supplied with H_2O_2 =

12 Test cell Reg KOH unpurified no H_2O_2 used but put in after Cl_2 taken out

13= WE use $FeSO_4$ without recrystalizing we use practically the whole of the crystals hence sometimes we will get in batches more or less impurities which will go into the different mixes in different amounts + unlike these impurities may not hurt the iron pocket they might be very detrimental to the nickel by being transferred across in the Electrolyte So we must look out when we make iron for the nickel as well.

14 Its probable that the trouble due to Hg globules coming out + amalgamating with the plates + making vibrately Crosses that some metal can be added to the iron that forms a strong amalgam with it + not decomposable except at very high temperatures, much

higher than it would be when the water was too low — at same time the Mercury on chg would distribute itself between this metal + the iron + on discha would pass over + be held formerly by the metal Bismuth makes a glazing alloy — Copper ditto also Silver, probably Bi would be the most promising — its lower in the Elec series than Lead or Copper,

15 = Run endurance Cells 3 filled with data of showings of our regular rubber, -

16 Iwa suggests that deep seated Sulphur from the Rubber may come out into Electrolyte + get oxidized to Sulphate then the SO4 ion would get conducted in the nickel pores + being extremely inert in KOH would plug up pores at Reversal would through the Radical out, but it seems to me it would show up as high resistance ~~to~~ in any event putting the Cell in Warm water for 48 hours should dissolve it out + thus accomplish what

Reversing does - Try it. =

17 = It is likely that hydrated Sulphide of Nickel mixed with graphite 8 to 2 will on Reversal (10) K ion on Ni + changing of KOH, to get to work - possibly Incre maybe small —

18 To rejuvenate batteries
Try 10 hours placing cell in Water at 1.60 Volts — No good

19 Ditto 150 Volts + reverse at 50% over normal for 10 hours - changing KOH. - Reverse only against Can pretty good.

20 = Logic - Reversing charge on Ni (10) K ion on nickel always rejuvinates a battery once good but which has lost some capacity - If a battery originally lacks capacity by reason of unequal filling of the pockets at the factory Reversing the Ni against the Can does

or Aluminum etc gets deposited — in Channels or the known gas polarization —

not increase it capacity at all. Therefore reversing the ~~it~~ arrangement the Cans cannot cause mix to make 12th Contact in fact its tendency to increase itself should make it worse. Therefore the conclusion is irresistable that the drop in capacity of a battery after running a few months is due to some chemical action which the K ion on reversal decomposes + throws it out into the Electrolyte — or heat alone increases its activity + Causes free Oxygen —

Now what is the chemical action its probably Combination of an acid radical with the $Ni(OH)_2$ to form the plain salt or a basic salt, Such as Stearate Silicate, Aluminate or basic Sulphate etc

What is the source of the radicals — CO_2 from the air, is the principal radical — SO_4 from oxidation of Sulphur from the Rubber — Aluminum Phosphoric, Silicic, Chromic, Iodine, B_2, SO_4 from the Electrolyte, Stearic a from something Unknown radicals from the iron which should not be impure — Unknown radicals from the Mercury in the iron — Radicals from the Nickel plating from impure nickel salts, and anodes + Radicals in the $Ni(OH)_2$ itself

21= Madeleine Battery is three good-
fifteen nearly 2 yrs- all zeros why—
is it because now was made in those
days which did not have the unknown
radical that hurts the nickel?? —
or was the rubber diffferent or is it stiffer
caps, or is Ni free of Radicals, or is it due to Briquettes

21= Test a good cell and a bad cell (17)
one originally good but has lost say
20% Cap-c-k — both on a constant
Res starting discharge at 50%
above normal, a plot Curve to
see if Resistance of the two
Cells are marked different,
This is not brought out sharply
in discharge at Constant amperes
Did this shows its not Res but MOH
out control somewhere.

22= Make several indurance cells 2 of each
with Ni mix screened to sizes, from say 40
60 80 100 120 140 160 180-
+Run say 20 times+ then test,

23- In the Ni plate may there not only be the simple insoluble salt such as $NiCO_3$ brought about by migration of the CO_3 Radicals but possibly a basic Carbonate, $3\,Ni(OH)_2 \cdot NiCO_3$ — also there may be double salt formed with K such as $K_2CO_3 \cdot NiCO_3$ etc Even a Soluble K salt may combine with an ion of Ni Salt to give a fairly soluble resultant again the pores may get saturated with a salt such as Sulph K or this salt being poorly soluble 20% KOH prevents out the cloudy the pores that the pocket receive only a partial charge during the short Charging period, & thus the pocket loses not unlike those which all the pores are open — Varying porosity by changes of pressure in the press wheel may vary as to deleterious Effects of pores being filled with Crystals, again Concentrated Solutions within the pores of the K Salt of a radical might produce colloidal deposit Secondary reaction on the nickel hydrox

24 = New experiments with chemicals which may effect the NiOH, endurance 2 of each –

Borate K – Phosphate K, Arsenate K, Aluminate K – Manganate K, Iodide K, Chlorate K – Perchlorate K, Hypochlorate K, Formate K – Sulphide K + H_2O_2 – Silicate K, Antimonate K – Stearate K, Oleate K – Albuminate K – KOH boiled in our rubber, & used darkened – also old rubber used in IC cells – also regular hard rubber. use chips, Mexican Asphalt or gilsonite boiled in KOH, + solution used, Our regular black iron boiled in 23% + then diluted to 20% —
Comm. OH in Sol — Tantalate K –
Niobate K, Zirconate K –
Barium Carbonate boiled with KOH + sol. used
Lime ditto – Strontium ditto Magnesium ditto Magnesium OH ditto, Uranium OH boiled – Succinate K – Oxalate K,
Sulphate K – KOH boiled with filter paper + Solution used,
KOH Boiled with lime – KOH boiled with BaOH
ditto with Strontium – Sulfate K KCl –

KBr - Kcy - Kcyanate, K Sulfocyan,
K NO3 K nitrite, K Jodrate, KOH boiled
with Litharge, Stannate K, KOH boiled
with Cd OH - Zincate KOH,
KOH, boiled with CO OH, KOH boiled with Ni OH,
K_2CO_3 — NH4 - NH4 Carbonate,
K Fl. Potassium Sulphoferrate,
(Prussiate sulphide) — K Ferrate,

25 = Mecke Pockets of Carbonate Ni
8 & 2 grafite, well rolled;
3:2 grammes — ~~One part to~~
~~1 Nickel~~ ~~pocket between 2 grams~~
~~Charcoal proportion~~
Charge one diagonal wire in 20%
KOH, with Hydrogen pole, Charge
the other with Oxygen pole
a gain the wire in another Cell

with 20% KOH = then put, the Oxygen charged one, each segment 2 chgd rods + discharge — (Charge 15 hours at 200)

~~Heat treatment~~ Now reverse the one that was chgd on Hydrogen pole on new KOH, charge it on Oxygen pole 15 hours — then plot between 2 chgd rods + discharge —

If Results are poor —

do the same Charge over with new powder again in KOH & 1.7 Sp Gr — with wire —

+ discharge Reg Temp between new plates

26 ~~Sulphur~~ $3H_2O_2 + Co_2 + 5H_2O$

Sol in warm Ammonium Chloride —

See if any solvent will differentiate between active + inactive $NiOH_2$

(10) Separate by Solvents w. 2 parts or more separate

27- Take some well known good N_4 Mix
Expose about pound to atmosphere
where there are no chemical
vapors and make 2 test
Nickels Every week & see if
long Exposure to air causes
it to become inert -.

28- Use good mix let cups remain
under jar in CO_2 & Run ~~two~~ three every
3 days. Use 12 cups
Then, while determin Carbonating
diff. as above with H_2O in sponge in
addition to CO_2 =

29. Make some N_2O_3 by igniting Nitrate
then reduce this by a reducing agent
& make grid - it goes to green by
several reducing cycles to H_2O_2 etc.
Hydrogen Vapor dont work see 2652 2653
but ammonia may work, H_2O_2 dont work
see 2654

Standard Nickel
made Cup reversed, from outside

2733 orig 92 99

Chg 200	43 h	run 150	528	101	103	9
"	18	" 500	478	102	105	10
5th run "	22	500	566	104	108	12

Dup w. original 98 106

1st chg 200	43 h	run 200	589	105	110	10
2 "	26	500	561	102	102	
4th "	22	500	550	112	113	shift

Dup orig 93 101

1st chg 200	43	run 200	544	102	104	9
2nd	18	500	479	103	105	10
5th	22	500	576	105	106	12

Possibly mix can move on smooth Cup when it swells & Cannot withdraw as burrs?
This would cause mix to even up
589 is very high for Standard Mix
What was weight as next recorded
Was outside Cup reversed also
if not the burrs would interlock & make a tight Crimp —

Remarks from SL Books -
See 2445 — "But 2 lbs of Bi on Fe"
2621 - get the Voltage Curve - see if it ain't low -
See 2645 KCl Electrolyte, good - watch small swell -
2733 - note burrs outside give fine results at high rates - even with poor Bi (RC Standard Bi - This poly
Committing to do with face Carbonate + different Conductions at the burrs of the Mix — Note that Standard mix
Never runs so well as Reg Mix until due to language, Keeping, + Exposure to air - five days it due to coarse stuff in it & it is not selected as a high mix —

What is - 2756 - 2757
2764 - 2765 oxidized except OK at normal but only 7/16 9Z at 500 rate, ??
Explain this — Even Reversing 2 days did not improve high rate but very little,
Pressed pipes Reg cups are cleaned by Electro-washing of greed from dirt + oxide mixture,

* Displaced KOH,

Evidently reversing after ni gets
swelled + mushy only serves to close
up coherent channelling by growing
almond cake pieces between the
Ni has got soft, its likely that
Plates skinned okay in KOH
for 1 hour or more without any
15 sec to get well soaked in
KOH before electrolyzing
so there will be gas formed in
the most closed spaces.

Lowender of Ni by Hydrogen from
Oxalate, mixed with graphite rolled
Wonderful work in 25% KOH, at 190 Faha
with big Current density to form
an active Ni,
What is 1858 —

See 2083 - why was result so good + swell
so great, - was it viscosity effect, oxygen +
growing - that swelled + so the pressure due to
swelling that brought more to surface pressure
increased Capacity —

* See 2105 - Reversing that here with Carb Nitty
Made it worse but 2106 Deep was
okay Reverse before put on charge +
then gave 4.50 to Volt on first day see it
also 2107 - Rev before okay

2142 2143 cobalt oxide, $NiCO_3$
~~$NiCO_3$ + KOH boils down~~
$NiCO_3$ + KOH boils down

2189 - 10% NH_4HCO_3 another Case of
fine results by reversing 12 hours previous
to fourth 5th Curve white weight
of Cake - Don't reverse
also 2201 Reverse that before charge
fine results - Don't reverse. 33 charges -
dates 2204 2205 - 2209 not included in this,
See 2209 - Swell, strange.

* 20 to 80 mesh new process ni BH_2 breaked (5 min in MeOH Containing MeHSulfate. Washed + Dried 842 gms wet mix gave for 3:2 as high as 645. Swell 56— 1st 565 — 20th 502, 158 ml, The Drop washed (80) mm was not good 470 1st 387 5th Swell 25% —

MeHg gave worst results

Legrand current results

2321. orig 85 95 94
7th 107 104
23 swell — 3.45 — 230 mg/l

2322 Dup of 2321 Removed 24h 5% before chg.
orig 87 95 99
30h 110 104
23 swell — 3.95 — 263 mg/l

7 gr MeOH 2 gms VX fine grind quant + cc 33%/ron, rolled, added 1/2 gm Coarse grafite - rolled + stirred

See 2222 2223 2224 as this 17% fine was grafite added evidentially when 3:2 Cake weighed out — ? —

~~MeHg~~ — added, seems improve all pockets, See 2227 — 2236 -

See 2234 — Why so low ? notice improvement made by Coarse grafite, — ditto 2235 See bad effect. fine-ort grafite, 2243 ———

See 2251 2252

Write 2263 —

~~Remove [illegible] before chg~~

Remove before chg — 2255 — 2256 — 2257 — 2285 — 2321 + 2322

Write different 6/chem 2303 2304 2305 2306 bad

~~up to 2320 bad~~

To test a fully charged room after chg put in 2 cells + add Bromine - what left in 2 cells

Reverse before chg - All reground cells show higher Cell on 1st chg
2339 - good — 2340 good, 2357 2359

Co

~~bl~~

See high output from 2187 grams -
1232 — 20% —
1237 ~~very high output~~
~~good~~

Note - ~~1485~~ 1486 1487 - little loss at high rate, Hi mix ground fine, + 1488 1489 ground Coarse Tsandy
What are 1090 to 1094 —

Construct of KOH in forces ~~gas~~ gas out,

Can it be that Sulphide radiant precipitates Lime Bad etc in Mickel which Chloride do not,

Showed marine Coral Calc with Lime Bar etc in Mickel + use Electrolyte in Sulphates in

Note 1069 – Where 4.5 Ni in 35% KOH went to 720 + Then KOH chgd to 20% & went to 710 738 730 – Showing that only effect of 35% is to produce ~~a~~ gas ~~in~~ & soften NiOH film so grafoils in the Carbon ~~is~~ good – in some way else

Off charge for a period & Chem resumed

1731-Bi 660, after rest 7/13 1 month

1737-Bi 574 – after ~~with~~ rest 640 –

~~2643R, 1647 (for 2 wks) 946 Recovered~~

See 2685 – where after 8 Runs in 21% – put in 33% & Runs no improvement

2378 = Why did Reversing have such a bad effect, forced reduction Evidently did something bad – Dropped from 432 to 293-220

~~Pocket~~ Pocket Plaque in 7% NH Sulfate, 2379 dichtgd bad ~~in~~ in same Reverse test & had in NaChloride 5.5 – 332-2389

Dry mix — Made paste 5% $NH_4{}_2CO_3$
3/2. Reversed hot 12 hours
in 5% KOH Charged 3 times.
33 charges Started

1st	567 —			
	567			
	602			
	612			
	667			
	652			
7th	675			
22	684			
~~28~~	535			
31	598			
33	571			

Caliper 1st 85 98 95
reference 120 111 112

47 small —

Wet mix was Ng

1st	355	orig	88 98	100
2nd	325	3rd	101	105
3rd	270			

Not reversed,

Paste made from coke passing 100 mesh using
binding with 5% NH_4OH 5% $NH_4{}_2CO_3$ 90% H$_2$O —
Then wet made

One of the best cells is,
3.2 Dry mix made. Ni paste.
5% $NH_4{}_2CO_3$ 8 g 2 fine graphite,
Lis. 2189 —
Discharg 150 — highest reading
684 — 33 Runs — good at end
Charges. It was reversed
12 hours in 5% KOH charged 3
times before it went on
Charge. Was the Carb KOH
dried out or discarded out,
~~Explosion 22 01 this was a~~
~~reverse before charging~~
5% KOH. Dry mix
went over to 708 had 3.2 cake,
but says 1:9 NH_4OH —

Here is a Case -

2305 - $Ni(C_2O_4)$ + graft to precipt treated with 4 3/4% KOH. Hypod for 3 days + well washed rolled 20 min moist with 1/2 cc. KOH to 4 1/2 gr ammon

3.12 Dry

to Volt.	84 Calipers
385	swelled to 124 on 3rd rem
215	Swell of 40
155 -	dishgd 150

A Duplicate. Reversed Pat 12 hours in 5% KOH.

to Volt	82 Calipers
480	120 on 3rd rem
477	Swell of 38
500	

dishgd 150

What did reversing do-make pores or throw out some radical or concentrate the KOH so cell could be formed once for all - (10) all in to NiOH which is a conductor, or after the film on Graft + garnet Gelled Contact

Water 2442 ~~+ 2443~~

Iron Explorer 2477 – [illegible]

put in separately or precipitated
with mix of separately the strange
+ good results.
I guess equivalent for 3.4 2 lb packet
884 the Vault, apparently books
show it a pp mix with graphite.
Then needles of $Bi(OH)_3$ added + rolled)
10% needles – ½ cc 2% KOH. 52 swell
on 36 hr run, 4 still good
~~with~~ big drop at high pressure at 2477

Perhaps $Bi(OH)_3$ is slightly soluble
in KOH at it might be beneficial
in solution. The $Bi(OH)_3$ put in cool
as a precip – I notice Bi had
prejudiced Effect in the war
Pulbook somewhere –

$Bi(OH)_3$ doesn't seem do very good
in KOH Sol

Cumulative

2404

Glycerine added to mix makes strips bend

1.065 gms Glyc 487
422 18 swell
2405 372

Dup Reversed before put in chy
457
396 20 swell
352
340

1% Glyc 2406
410
335 21 swell
293
282

Dup of 2406 Reversed before chy
510
462 19 swell
430

2498 – 100 gms paste 50 gms Na_2CO_3 + 10 cc NaOH, mixed the $NaCO_3$ dissolved & mixed with the paste. Dried low heat. Washed free alkali. Chy-Ray

212
155
92
65

Dont say if there is graphite

Notice 2536 – Extra heavy plated Caps Req Stiff

352			3.6 –
305 –	150 rnds		
280			Thus shows a mill in Carriage or Cylinder
75	500 "		
260 –	150 rnds	=	31 small –
305 –			

Loss Capacity Req N1 test pockets 8th Rims

2586 –	1⅛ loss		8½ loss	2½ loss
2587	2⅛ "		6½ "	2 "
2590	+ 1 ⅛ gain		7 "	1 "
2591	+ ½ gain		7 "	2 gain –
2594	⅛ loss		9 "	2 "
2595	7⅛ loss		10⅛ "	
Etc	1⅛ loss		1½ gain	

average 5.2 loss average 1.6 gain –

2675 2676

Three Pockets with 3.2 one with fine mix other with Coarse mix on 20 mesh

	fine	Coarse	
1st	552	520	500 Rds 458 –
10th Rim	537	502	" 275 –

This would show that fine mix beat a Coarse mix, not enough surface for the rate deck circulation with the big particles –

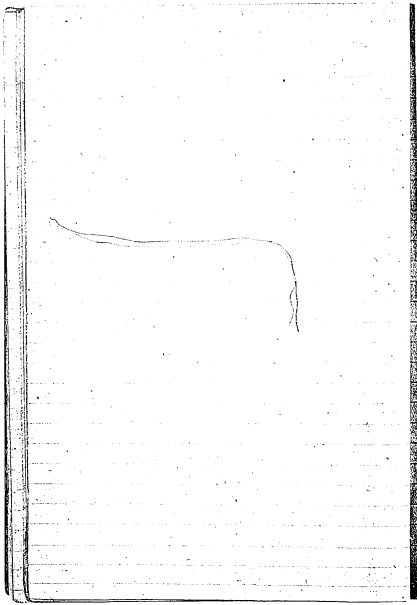
See 2781. Where other Exports made with Runs $\frac{30}{1000}$ deep corrugating die
Standard Ni –
at 100 rate 495 to 500
500 383 to 325
Possibly 30% drop. Swell 12 Cents
scarcely any swell at Edges –
When put in 33% didnt improve
any

Notice 2681 2682 – with deeper
Concave die, $\frac{35}{1000}$ – Went down to 151 to V
on 12th Run at 100 rate, 6 fifth are very bad.
Especially at 500 Rate, possibly the 16
Swell on Edges were Convex total
Swell 39 – Now what is cause of
this –

9 pockets see 2701 were made up
Standard Ni – various weights Standard Ni
Eight runs taken – dividing grain by milamp grains

	to V	
2.7	423	15.66
2.8	435.5	15.55
2.9	447	15.41
3.0	476	15.53
3.1	485	15.64
3.2	498.5	15.58
3.3	519	15.72
3.4	534	15.70
3.5	595	17.00 ?

Shows increases directly as to weight
Except 3.5 –



I notice another Cap with burrs outside that runs fine Especially at high rate.

100 Rate	528	Another	589
500 "	500	100 Rate	
		500 "	550

another
100 rate - 545 — swell 12.
500 — 516
All above standard Ni. No 2733-

Next page Reg Ni - burrs Vapour inside.
100 Rate. 528 - another 100 rate 523
500 — 450 500 " 425 -

Now why so this — so it because mix could flow evenly with burrs out + thus get more even contact,

Only 6% diff bet 100 + 500 rate burrs out
+ 17% " " " burrs inside,

Also notice that Capacity was better because standard Ni last quiz as good Cap as Reg Ni

2752. Standard Ni 3·2 one end pocket

Empty –

100 rate. 466

500 – 158 Cups

2753

100 rate. 480

500 " 232.

The low rate don't seem to affect it much as S Ni is low about as ab-ove but at high rate, but on high rate loss to 56% – as against 3·2 w burn outside 17% with Reg Ni & 56% S Ni with soft end Explain this – Swell 15/100 about.

Kerosened cups dried on heater –

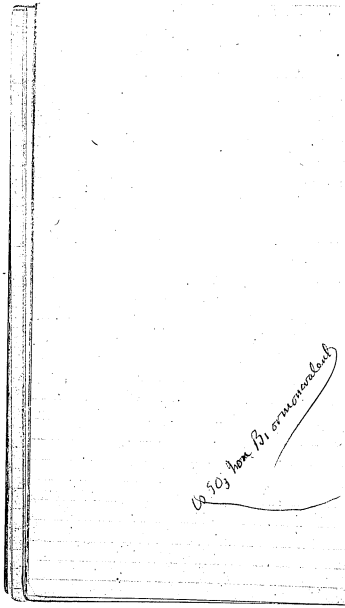
Standard Ni 3·2 – shews

26% loss 6rt 100 + 500 discha-Reg rate about normal

See 2762 –

When cups oxidized, Standard Ni – 3·2 at 100 485 which is normal but at 500 rate only 92 – as loss of 82% –

Why does it not effect the low discharge rate, is it due to polarization?



~~What is 1866 to~~

Special No 2 Eyelet cups shows small drop 6ft 100 & 500 probably because smoother allowing mix to flow better 11% drop - but genl mix used 3:2 and only gives 488 average to V which is low -

2 nickels of Ni in cups dipped dry into Naphtha against 1 standard Fe 100 Rate 990.
500 " 917 - about 8% drop

When dipped Kerosene 10% drop from 100 rate to 500 rate - Standard Ni -

2853. Genl Ni 3:2 100 Rate 520 ~~500~~ 308

after 8 runs 1/2 gram K_2SO_4 put in & probably 1/2
100 rate 500
500 204 was as low as 167 -

How about this —
What did SO4 ion do —

Arsenate K does not accumulate harm—

With perforation about closed
100 Rate 527—
500 " 235— 60% drop—

See 2920 - 2921 - 2922 - 2923 } Explanation.

2944— Ni pockets made Glen ridge
before Yanney deepened cups
100 rate - 533 - 55
500 " 533 " "
Dup Why is this

100 rate 502 }
500 " 483 }

Those made June 7. 2948
100 Rate 590 Dup 100 rate 545
500 " 550 500 " 492—

Why

KBr = HgBr sat KOH
HgCl "
HgI Solnable KOH.

Different Chem on Electrolyte
1 Run Charging 24 h → 2 Runs 3 3/4 h
Run at 200 -
Charged 280
Standard Fe 415 - 2 Markers

Reg-	KCl	KClO	KBr
1006	1080	1150	1132 S
780	753	783	803
653	751	775	823 I

ZnO	Benzoica	$Al_2C_6H_6$	KI
1105	1105	710	354 S
557	730	506	160
200	440	420	168. r

$K_2C_2O_4$	K_2SO_4	C_2H_6O
1145	1133	1017
703	798	727
623.	718	733.

Ammonia	$K_2B_4O_7$	Oleica
942	1067	717
412 S	700	477
200	373	267

Turpentin	Anilmoid	Pyridin
1137	1123	637
747	731	220
417	340	157

All the other Solutions much lower - + they showed it on 1st charge they must

the iron as was afterwards found out but how did they hurt it on the first charge, certainly not on charge must have done it on discharge the acid was passing to the iron
Note the High economy of KBr - 82.3%
amp efficiency
Discharge ratio is equivalent to 28.8 amp for 2.18 — Has insolubility of HgBr HgCl. anything to do with this —
Hg1 sat KOH —

We should make some small lead Cells with gradually increasing amounts of KCl KClO4 & KBr. up to a point cobra pockets are attacked —
Also some check cells with unplated pockets —

Nickel solution
~~Note~~ 1723- Ni prep by BaOH ?
842 mix 312 533 75 rate 492 150 mA
It was Ni Cl precip by BaOH —

884 - off thick cliffs.
8.2 grams 20% hydrometer closed 1/4 —
Chg 1st dbl 58
on 5th dbl 59 12.15 to Valli
Today Wes account of Nickel Has
grossed 84 f worked 9 hrs 5.2
Tobacco Harbour, Labrador
Present Nickel only 9 hrs 550 at least

Use Rule after a packet has Run
for some time in 20% pulling it
in 35% makes it average
see 506 507 at high rate,
There are weighings, see 558 —

Apparently 6 grams of acid in
old Makes 6 oz wet, without
Hgw from the dust Take
off on Capacity like modern
one with Date in 7 é
How about Rogers Mendelein bailing

In the new Iron process where Fe_2SO_4 is fused in NaOH the resultant dark iron particles will contain some Compound formed by action of NaOH on the impurities or something that possibly might be burnt out or drawn off by igniting the clay oxides in the iron before Reduction by Hydrogen.

How would it do to Volatilize $FeCl_3$ into an atmosphere of Red heat Containing H_2O Vapour Result very fine Oxide + HCl. Which Can be used in H_2O Gas) be used again —

Make set pockets diff. [illegible] to 132 grams $NaOH_2$ vary by 20. up to 150 mesh — Invert not 1 hours —

Mix $BiOH_3$ not needed but approx with $BiCl_3$ and no Hg — roll moist with dry — make 7 to 2 Bi 20% $BiOH_3$

Mix Black now with dry Cub Bi dry —
" " " " Rod with KOH.

Put six stoppered cups in 20% KOH. for continuous Charging. To 100cc of 20% add
3 5 7 10 15 25 grams KCl —
ditto KBr — do KI — This will take us the maximum we can use of KCl KBr + also what KI does —
be careful not let solution get Carbonated perhaps best change it Every 2 or 3 days — better use Closed box + Caustic Lime to get rid CO_2
Also try above in KCl will Cups not plated —

Paint inside of Cups before making up with 3:2 Reg with Platinum Chloride thick + reduce up H, to get a platinum surface see about polarization, economy etc —

If fill a thin cup with paste of NiOH & red iron in Ht. to get a sponge if it cracks use mixture of graphite & paste, after get sponge - saturate successively Ni SO4 + boil in hot KOH, until pores full. Then see increase of weight & Run Req —

Duplicate the spongy Ni Cup & use: Fe SO4 + pp & by Heat KOH & a Sol Hg Salt, until pores full —

Put up some cells with following Electrolytes, say 3 grammes of Each — Zn OH ZrOH, BiOH, Al_2OH, CO_2 from K_2CO_3 — CoOH, CaOH, SnOH, Silicate Soda — MgOH, CuOH, PtOH, 200 mlg Arsenic acid, K Sulphite, Na Hyposulphite, 6 gramm filter paper boiled in KOH, — PbOH, put seperators now boiled in 21% 3 hours

KTiOH. Tantalate of K - AgOH; HgOH. DiOH. ThOH. Phosphate K. Phosphite K. Boil the KOH for 10 minutes with 20 gramm Req from Mix - don't get KOH Carbonated

Boil, KOH 10 minutes, with 10 grams Barium Carb,
" " 5 " Soft gasket Rubber

5 grms $HgCy_2$ in 100 c 21% KOH,
5 " KFluoride,

Dry for Velasco pressed Oxychloride of Copper

1 Cell 1 grm KCl 1 grm KBr 1 KFl.

Make Cobalt by iquite Oxalate, reduce by Hydrogen & use req amt HgO dope

Ditto without HgO dope -
see economy & Co prosty.

Make Cell unplated packets see economy -

Make Cell packets entirely of Nickel got by plating, see economy

Reg test cell very complicated
Electrolyte. 20% KOH 100 cc To
which add 1/2 gram of following
KCl – KBr. K_2SO_4. Kalatite, $KClO_3$. K formate.
These are all soluable salts with K'

Date's cell –
1/2 g KI – K Phos KBo K_2Cr_3 K Chrom

1 Cell 5 grms Sodium Acetate 100 cc 20%

There may be something that
improves the cell & at same
time something that is detracting
it – The improvement reaches a
limit while the other goes
on & a point is soon reached
when the cell goes bad –
This is so with the Lead cell –

Possibly we should have following new groups

1 3 Cells without any rubber - glass rods 1 old glass bottom, 1 no side separator use glasses pins or a substitute, Remove group separately - for 30 amp 24 hours - Note No 2

2 Req £18 - Ni group returned to a porcelain jar 175° Fahr pure sheet nickel. 30 amp 24 hours, assemble with New group washed in a jar req — Group 15

3 Another £18 Ni group returned in a porcelain jar 175° Fahr for 48 hours, against CPNi sheet 30 amp 24 hours using same new group same bath as in No 2 Group 16

4 Another £18 Ni group returned in a porcelain jar against CP Nickel sheet 30 amp 24 Hours to use an new group which has been made Cathode 30 amp 24 hours 175° Fahr

Weller boss —

5= E.18 Hi Group removed on porcelain jar 175= 30 amp 24 hours, Iron group made anode, 150= 7 ohm 30 amp 24 hours —

Notes on defects –

1= Notice several cells just assembled + welded on one long heat line liquid comes up through rubber gasket at poles

2nd Notice sometimes gas bubbles comes up through gasket of poles, which stops when new gas top is lifted

3rd notice many gas tops stick, others have no up-down play – find Ends spring wire too long – groove wrong

Notes of
Test of good + bad Cells from Shuttle-Broken Wagon — Cells 1251 to 1100 1854 etc.
Calliper plates made of stiff black from 6 plates bad cell 1248 D —

Before Run

87	95	93 —
after run		
93	96	96
97	95	95
96	97	98
95.3	97	97.5 average

Noticably scuffed when we got them

Calliper of Original Plates

Bad Cell		
82	85	85 —
86	91	90
82	88	88
85	99	90
75	85	85 —
82	91	97
97	90	88
84	85	88
83	90	90
84	95	95 —
83	89.9	89.4

After Run

Good Cell		
92	92	93
93	93	92
92	92.5	92.5 —

Packets leaked from

Bad Cell		Good Cell
317	Rates same	463
265		457
295		400
292.5		440

Then stuff taken out Good cell a portion new packets & rerun

391
491
483
388
416
448
457
442

75° discharg rate, 3.2

There may be error here as perhaps original pkts only had 2.18 or so + 42 would be wrong - However stuff was not washed -

Bad Cell - pockets as on top was continued to Run this

	Swell, original 85-90
317	87-91-92
265	
295	
303	
275	
307	88 92
244	90 - 93
422	Reversed last 24h at 500 - 2%
	95 95

possibly of NiO_2 is formed originally in 33% it somewhat for the original $NiOH_2$ that it runs different from what it does when originally run in 20% + that therefore 33% has no effect, for instance an engineer might have in 21 made use calculated by Otto Lead coal, tobacco in 33% it might become a higher explosive or be flammable + be flammable each but if in 21 it got to water that Condition not subsequently brought higher by 33% formerly 40% and a very much current might be formed + different under then 21% water

Other tests confirm this

The swell however is greater after running in 33% —

This would show that it is a question of graphite + that 33% ordinarily used produces a different Condition as to the graphite or acts Chemically or something in like $NiOH_2$

S22 2685

21 gr Reg test run

10% Kott

				100 Run
1st	412	91	98	
7th	420	93	95	1
8	421	95	97	0

33% put in

			Chg	Run 100
9th Run	438	93	98	15 hours "
10th "	446	94	98	16 " "
11th "	406	110	102	63 hours 5 "
12 "	346	104	107	17 " Run 500
15 "	477	115	104	3 Days " 100

This shows that 33% has nothing to do with the Capacity of the Nickel at least after it has been run some time in 20% — possibly Something might have got into $NiOH$ pores of the particles + prevented 33% from getting in or doing its work — The reason it swelled afterwards was due to Viscosity making gas pressures Yet it didn't get better by the swell —

2142 - 2143

Carbonate of Nickel 312

having 25% less $NiOH_2$ in

giving in a Reg 2.56 NiOH
of in 2142-3 1.92 "

2143 - gives 716 to a Volt of Calculated by weight of $NiOH_2$ as compared to Reg No 512 - This is a dry mix - probable reason is that the CO_2 went out & gave porosity & the graphite didn't get covered with sticky film of $NiOH_2$ = Work this up -

Swell - Original 90 94 96

1st		128	110
2		129	117
3rd		127	114

Possibly the Current with very weak KOH or K_2CO_3 could be used to get CO_2 out without making a swelling $NiOH_2$ =

This idea of getting porosity & Clean graphite is OK if can get the bulk down to fit our pockets —

Notice small concavity made by Crumpacker die -
The wall is admirable it is a wonder it ran so well - Dry mix means no water or KOH, but Na_2CO_3 powdered very fine, if it could be got Coarse like reg. Na OH would + then Corroded to get no fulmination it would burn & run better, but the wall from wide reaction the use of any salt of Na is inadmissible

Possible a Cylinder say 1 ft dia 1 ft thick of mix might have CO_2 percolated out but when it dries probably Na OH would dry & close the pores -

Notice 1697 – Mn Chl precip by $Sr(OH)_2$

1st	451		orng 33 94 72	3.2
2nd	606	5th.	115 103 103	
7	609		Lines v. pretty good.	

See 1848 = 3rd run Equivalent To
700 gm per 312 gm Reg

Strength 62 gm & ideas to
Make a set of tests using
Thousandths Compounds of Nickel
842, in grid or get radiance rep by
Reasoning with very weak acid
or KCl in water to get result like
Condensing Steam plus, Boric Benzoic acid
Phosphate Hi - Arsenate, Borate,
Fluoride, Oxychloride, Tungstate
Molybdate, Manganate, of Hi 2to 3
possibly Mly for Cmbs - chemistry.

Hg O Valency

Note. 2107. Reversed 12 hrs from Equals 742 for a Regular it was reversed Before [illegible] was it 21% — swells a little liquid — 2 2.12 gm NaOH

These series of stuff very good several trials — graphs pp with NaOH, Alcohol dried + reversed. 17% Coarse graphs, 2105 of which 2107 is deep dish hard coarse graphs. —

2149 — graphs pp $NaOH_2$ or 6% Hg_O

	.75	V		
1		720	387	115–112
2nd		657	375	118 114
3rd		637	345	121 113

Notice by left V = .75 —

& When Reversed before chg 5

	.75			
1st	737	445	119	117
2	675	467	121	116
3	670	358	124	118
4	585	317	124	118
5	605 (Reversed 24 hr)	302	124	120

Evidently Mercury is bad.

See 2180 also Rev — 10% pyroph — NaOH reversed — bad but not so great chg

before .75 + V

Note: 2183. 2184 2185. 2186 —
the chromepaper —

~~See 2199~~

Mi Mix — List of Items that might be used to stick graphite on that might not be affected by Nickel + Stuff get out by washing

Quinine hydrate Resorcin Urea
~~Tungstate Calumma Benzoin~~

Gelatin — Acetate Cadmium
Allophanate Sodium
" Glycerate
Allylate of K
Aplin
Arbeine neutral sulphate dries to horny mass
Caprealic Jelly
Chrysamisic Acid Co + Cu Salts
Cimicylate K
Ferrocyanide of Sn Zn
Cyclamin -

Note

Note why not use an organic insol Ni Salt Mix with grafite & then instead of acting on it by K ion as Cathode make it Anode & Oxydize the Radical — it might not swell —

Also Carb Ni mixed 8+2 graf & Subjected anhydrous NH_4 gas then if it form NH_4CO_3 heat it Ho drive out CO_2 no NH_4 Car

Elemi resin NH_4 Converts to gelatinous

Formate of Tin "
" Uranium "
Gallotannate Sb "
Oxy guanine. "
Dichlorohamine jelly
Morandin
Nitrosacharose glutinous, soapy
Parellic acid, gelatinous
Pectic acid, "
Pectates "
Saleratin "
Solanine, sol Al—salts of 5 ditto, gelat
Sulphoglutinic acid, made by Sulphuric Anhydride on excess of Naphthalene Glutinous.

Tetrachloronaphthylsulphurous K salt gelatinous
Sulphate Alumina tetrabasic jelly when wet,
Amylsulphate of Al — gelatinous
Stannate of Ammonia "
Metastannate K "

Sulphate Amylamine, gummy
Amygdalic acid "
Arsenate Tin "
Action Chromium Benzoic Acid "
Camphoromide "
Chloroacetic a gum-
Chaldonine acetate gummy
Citrate of Aluminum gum-
Mono citrate Ba gummy
Ricic acid Na Salt, "
Furfurine phosphate "
Malate of Aluminum gum-
Mannitic acid gummy
Sulphomalydate Cerium Salt "
Morphine pyrotartrate gum
Dimethoracic a gummy
Hypophosphite Aluminum gummy
Phosphate Titanium "
" Zirconium "
Glycophosphamates of NH4 "
Pyroracemic acid B Kind forms gummy Salts
Methylsulphurica Aluminum gummy
Metalahlmic a "
Glycotartaric acid "
Sugar Molasses

~~Dracto~~ Varnish Like Chamo

Conine acetate.	
Hydrochloïdic acid Na salt Sol Al	
Sulphomolybdate Manganese.	Varnish.
Morphine Acetate	"
Peloxine	"
Quinine Borate.	"
" Chlorate	"
Rubian	"
Shellac	"
Selenate Cerium	"

Nov 1 1904

Make test cell with grooved MnO_2.
~~Soak~~ Warm for long time in 33% peroxidation to Elements permitted
then wash water long time, dry
then use by rolling — by 40% abs.

Possibly Rey cups soaked in 45% KOH, warm for several days more several. Then, soaken water for various times run in 20% — not swell —

Make 3 test Ni, both Cups double to see how stiffness goes —

Make 3 test Ni. Split graphite, 60 to 80 mesh NaOH, glycerine + Swage tumbling 60% soak crude glycerine ext, - 1% permanganate glycerine coat NaOH, then put in graphite

Let, lightly press, soak like glycerine ext, dry clean dry then smooth die then Corrugating die —

Also Try on turntable Key bottle one, Various solutions in high grade alcohol in which are dissolved Salts of Base reactives, Citrates, chlorides, acetates, prostate, are keep these kinds of on Good NOH products called to guilt, goes on, -

Jewelry over Cramping Plates too deep Concavity, might make a machine that is adaptable for purposes

It would be a good thing if was carried Coat the graphite with Nickel Richard by H, to very fine velvet powder in Thimble the powder with a binder to Coat graphite with it i then Coat NOH with an alcoholic Salt + Steak graphite on then the ring would have so much Paraffin it conducive flow -

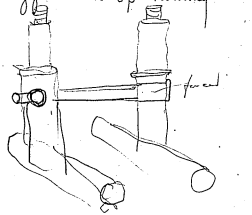
See 15 pages back

Notes Battery defects – Nov 2 1904

4th = found 4 cells
front waverly – 3 gave
What appeared reverse slight voltage
but its only Voltage by Trigon Cam
No 1 gave ½ Capacity found nut at
* between Stud – moved
Cam & it commenced to make –
it crossed the Cells – took it out
ok = probably put in in pkg room

5th = Cell in Waverly appeared
reversed it was sketched –
took Cell up stairs, shook it no
result put Current on & Voltmeter
& twisted plate post Cross Came out
probably all bad recent crosses
is twisted plate pieces in assembly
for shipping – some device must
be got up to stop twisting =

6th = Suggestion stop twisting



See 1961 —
N.O.H paste with 10 to 15% Hg Oxalate, mixed Dry 484 2
3.21 — 218 Reg mix — not washed
Even with Hg Oxal gauze 485 —
Pusell 14 —

What is 1974
See 1991 9&1 graft fine

188	Dup
190	188
280	190 150 220
285	

fund Res with definite program
aff Req Ni mix 100/1000 thick
Some Size as previously

Notice in many Cases a long
Change after 1st good drop of
2106 - Has very little Effect
Cly - 32 gpt 600 eighteenly
51 17 "
500 111 "
435 4 days.
but there

Exceptions

Effect
Change promptly
21/2 x 3 3/4 -
Coarse

the affect Cell room
disappear - Cell go bad
the question arises why do Cells
run higher in 35 #
vs 4 because Ratio is found Excess
in strong Solutions

amounts formed + this of these
gives better Conductivity -

Next

Equipment to try on pockets.

Charge | 100 ma | 200 | 350 ma | 15 hours

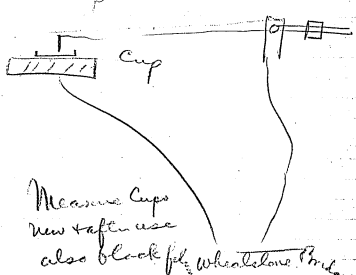
Then open & cut away surface 10/000 all over portion treated, clean & pour out to see where Blue or rather green shows —

Charge 6 pockets 15 hours — then discharge | ten minutes normal | 30 min | 1 hour | 2 hours | 3 hours | fully discharged

Want to see when black on Cup disappears

Make a presser contact

platinum wire wrapped



Measure Cups
new + after use
also block for Wheatstone Bridge

Take an outside cup clean in acid. Wash well put in ammonia wash well—a pocket Varla Crucible
Then put in KOH ~~and~~ charge 1/2 hour then rinse it out and put in a charged Nickel, ~~the~~ see what Mechanical happens ~~in~~ hours apart, to see if the ~~E~~ known wetted discharge the black felt,

Nov 8 1904

At last I have struck the right thing. It is thus in my way to evenly distribute the mix in the pocket, if even the cell runs good, if not the cell in Cores grow in Running or Backing
We have the 2nd charge of my (1st) the Chemical Mechanical Coherain the mix must on account of swelling make a new distribution of itself in the pocket, now on account of burns, more or less

depth of Corrugation, quality of mix, Roughness of Nickel plating etc, the Mix in its new condition Cannot distribute itself uniformly hence in some cells there will be Nearly as ten times absorbtion as in other very marginal. As the swelling of the mix is a slow process the cells will when Retarded by burrs etc get more & more uneven & one part will draw the Cups away from the other parts Now by storing KOH, we soften the mix, but heat will increase the effect of KOH to soften & if we use Hydrogen in lower surface of pocket will diminish the friction to sliding hence the mix instead of swelling Can flow until if time is given the whole flows out evenly for all acts to produce pressure Even hence all in Contact at high resistance obtained, in Course of time there will be further swelling & by Evaporating Cell To strong

Roff, heart + Clement, Wi Cochrane
against Cain et al to set aside & again
of new arrangement of wings
takes place as we bring the
case back again, The husband
should begin case calls before
Chairman originally, +
7 Thursday 12 other bridge cases
were assigned to case
so set the time that case will
remain good for long periods

Nov 25 1904 Experiments on H_2O_2 in KOH— I find that H_2O_2 in only 21% dissolves slightly. Red ppt disappeared over night crystals from drops ammonia. Ppt also with precip —

Found that H_2O_2 dissolved in 21% KOH. Turns yellow if few drops NH4Cl added —

Ditto if Carb Sod added — Solution warmed —

KCl no effect

Little KI — Hypophosphite Na, KCy — Acetone — added to 21% KOH dissolves H_2O_2 —

also filter paper treated with 21% dil CO_2, Conc. dissolves H_2O_2

If H_2O_2 in 21% is neutralized by ammonia the solution of Nitrates, Chlorides & the Red Color of H_2O_2 —

I is fried Canary colour —

Was using KOH purified by Walton. Base of Uric was late Hyderabad.

Cup giving following MAH, gives in E 18 lines

to V -	gives in E 18
555	160 amp
520	150
485	140
450	130
415	120
380	110
345	100
313	90
281	80

Alumminate Calcium not decomposed by KOH ditto Calcuminate Zinc. Calcium ferrite not decomp by KOH.

Copper sulphate insol KOH.

Acetone + Ketones of higher fatty acids. cause Ag_2O to dissolve in KOH. Thiosulphate, K KCy + IK do the same thing —

[ITEM FOUND IN BOOK]

Dec 13,04

Capacity of new E 18 cells put up since Oct. 1st, at which time we changed the weights of nickel pockets from 3.3 - 3.55 to 3.2 - 3.4

E 18

Sec. 78	Sec.79	Sec.80	Sec.81	Sec. 82	Sec.83	Sec.84
2-130	1-130	3-120	1-125	1-153	2-130	1-130
	4-162	3-140	2-156	1-159	3-147	1-156
1-140	3-165	1-147	2-159	6-162	1-156	3-159
4-147	2-168	8-159	1-162	9-165	1-159	9-162
2-153	2-171	3-162	1-165	12-168	1-162	24-165
2-159	10-174	12-165	1-168	10-171	9-165	5-168
2-162	5-177	9-168	3-171		10-168	2-171
8-165	5-180		12-174		3-171	1-174
5-168	4-183		8-177		4-174	
4-171			2-183		4-177	
4-174			4-186			
4-177						

Sec.85	Sec.86	Sec.87	Sec.88	Sec.89	Sec.90	Sec.91
1-125	2-130	1-130	1-130	1-115	1-153	7-171
1-150	1-147	1-156	1-150	1-156	3-165	11-174
1-153	2-153	3-159	3-153	3-159	6-168	19-177
1-156	1-156	3-162	4-156	2-165	15-171	5-180
2-159	2-159	8-165	3-159	1-168	20-174	3-183
5-162	1-162	15-168	9-162	24-171	Power off	Power off
14-165	1-165	8-171	11-165	9-174	40min.	40 min.
16-168	5-168	6-174	8-168	3-177	4 Hrs.	3 1/4 hrs.
5-171	6-171		4-171		before	before
	4-174				Discharge	Discharge
	3-180					
	5-183					
	1-186					

Sec.92	Sec.93	Sec.94	Sec.95	Sec.96	Sec.97	Sec.98
2-144	1-125	1-120	1-144	2-150	1-147	1-153
2-150	3-156	1-135	2-159	24-153	1-153	8-156
2-153	6-165	5-159	5-162	15-156	2-156	9-159
11-156	13-168	6-162	30-165	4-159	10-159	18-162
16-159	14-171	13-165	5-168		13-162	8-165
8-162	6-174	16-168			14-165	1-168
3-165	1-177	6-171			2-168	

[ITEM FOUND IN BOOK]

Sec.99	Sec.100	Sec.101	Sec.102	Sec.103	Sec.104	Sec.105
1-135	1-120	7-162	2-135	1-135	3-130	2-135
3-156	1-140	2-165	1-140	1-150	1-135	3-140
5-159	4-144	4-168	6-144	1-153	1-153	3-156
11-162	19-150	20-171	4&147	1-156	1-159	8-159
18-165	22-153	10-174	9-150	8-159	5-162	11-162
7-168	1-156	2-177	8-153	4-162	9-165	11-165
			9-156	15-165	13-168	7-168
			3-159	10-168	5&171	
				4-171	1-174	
					2-177	
					2-180	
					1-183	

Sec.106	Sec.107	Sec.108
1-110	3-140	1-110
1-125	1-147	3-135
1-135	6-156	1-147
1-140	10-159	4-150
1-144	9-162	4-156
1-147	9-165	8-159
3-156	5-168	10-162
18-159	1-171	10-165
13-162		4-168
8-165		

E 27 Cells

arts. 3,2 – 3,4

Sec.84	Sec.85	Sec.86	Sec.87	Sec.88	Sec.89	Sec.93
2-216	1-190	1-210	1-225	3-238.5	1-247	1-234
2-220	1-238	1-238	2-234	4-247.5	3-252	9-238
2-234	2-243	2-240	8-256	2-252	5-256	11-243
5-238	7-247	3-247	5-261	13-256	9-261	4-247
12-243	6-252	7-252	11-265	2-261	6-265	12-252
7-247	18-256	15-256	4-270	11-265	4-270	8-256
6-252	4-265	9-261	1-275		1-274	
2-261		2-265				

Sec.94	Sec.96	Sec.97	Sec.98	Sec.99	Sec.100	Sec.101
1-216	3-195	1-225	8-216	11-234	4-210	1-225
1-220	2-243	2-229	8-220	10-238	2-220	2-234
4-238.5	6-247	4-234	3-225	10-243	2-225	3-238
12-243	6-252	3-238	2-229	10-247	7-229.5	4-243
5-247	10-256	10-243	5-234	5-252	9-234	20-247
10-252	9-261	10-247	5-238		13-238	6-252
8-256	9-265	3-252	4-~~234~~ 243		1-243	1-256
4-261		5-256	7-247			2-261
		2-261				
		2-265				

Sec.102	Sec.103	Sec.104	Sec.105	Sec.106	Sec.107	Sec.108
3-210	1-225	2-210	2-225	1-187	1-202	1-229
2-216	1-229	4-216	2-229	1-220	1-220	1-238
1-220	2-234	3-220	4-234	5-229	1-229	5-243
3-225	1-238	3-225	7-238	2-234	2-234	15-247
2-229	1-243	9-229	6-243	14-238	3-238	23-252
2-234	3-247	5-234	4-247	16-243	5-243	1-256
5-238	18-252	5-238	13-252	6-247	6-247	
8-243	14-256	4-243	7-256		14-252	
7-247	5-261	2-247			12-256	
4-252		8-252			3-261	
1-261		1-256				

Sec. 109	Sec.110
1-226	2-220
2-220	4-225
1-229	1-229
7-234	2-234
5-243	7-238
7-247	6-243
14-252	9-247
8-257	17-252
	4-256

[ITEM FOUND IN BOOK]

E 45 Cells

New Cells Wts. 3.2- 3.4 June 25 Sec. 2

3-393
9-400
4-405
4-411
4-420

New Cells Wts. 3.3 -3.55

July 13 Sec.10

1-337
7-393
17-406
6-418

July 23 Sec.13

1-337
1-397
1-405
5-412
1-420
10-427
11-435
7-442
2-450
1-457

July22 Sec.14

1-360
1-435
5-442
17-450
7-457
3-465
5-472
1-479

July26 Sec.15

1-360
1-382.5
8-390
3-397
4-405
4-412
3-420
4-427
4-435
4-442

July26 Sec.16

1-382
2-397
1-405
5-412
3-420
10-442
7-450
3-457
5-465

July27 Sec.17

3-390
6-397
5-405
2-412
2-420
6-435
10-442
4-450
1-457
1-465

July28 Sec.18

5-375
9-382
8-390
3-397
8-405
2-412
1-420
3-427
2-442

July29 Sec.19

1-405
12-412
7-420
2-427
2-435
4-442
3-450
8-457
1-465

Sep.14 Sec.20

1-390
3-405
2-412
9-420
9-427
13-435
2-442

Sep.13 Sec.21

2-412
4-420
5-427
7-435
9-442
13-450

Sep.13 Sec.22

2-382
9-397
16-405
8-412
4-420

Sep.16 Sec.23

1-397
1-405
6-412
1-420
9-427
10-435
6-442

New Cells Wts 3.2-3.4 Sec.24

1-337
1-350
2-360
2-367.5
3-382.5
1-390
6-397.5
5-405
5-412.5
6-420
6-427.5
2-435

Reversed Cells Sec.26 Wts3.2-3.4

4-350
2-360
9-375
1-382
5-390
4-397

Reversed Cells Wts 3.2-3.4

Sec.27

3-350
1-367
5-375
4-382
2-390
4-397
3-405
2-412

Sec.28

1-325
1-360
1-375
3-382
4-390
3-397
9-405
6-412
3-420
2-427
3-435

Sec.29

2-360
10-367
8-382
3-390
4-397
4-405
5-412
8-420
3-427
3-435
2-442

Sec.32

1-300
1-312
2-350
5-360
3-375
4-382
7-390
2-397

Sec.33

1-375
1-382
3-397
1-405
1-412
6-420
13-427
12-435
6-442
4-450
1-457

Q. 1. 4,

[ITEM FOUND IN BOOK]

Ag – KI pale yellow
KBr yellow
K_2CrO_4 dark red
Ag_3AsO_4 – yellow –

Pb – KI yellow – K_2CrO_4 yellow

Hg – SH + $HgCl_2$ = yellow & red
HgO sol KI – K_2CrO_4 yellow –
Bi_2CrO_4 yellow —
CdS – yellow – A:

Arsenic – $FeAsO_4$ – yellowish

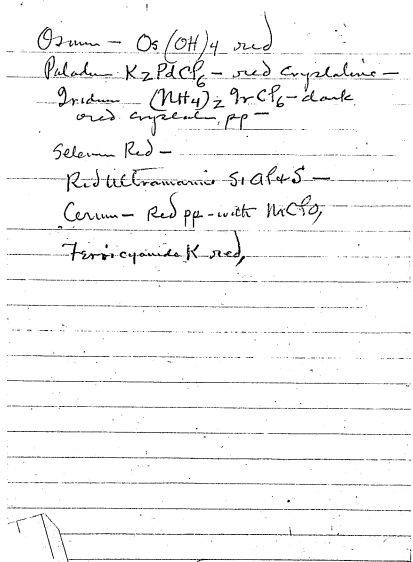
Sb – Sb_2S_3 Orange

Sn – SnS_2 yellow –

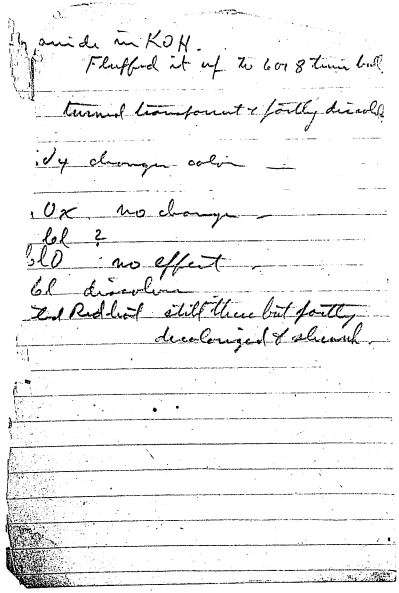
Fe – Ferric formate, acetate, Meconate.
Sulphocyanide – Soluble red –

Chrom – Bichromate Red.

[ITEM FOUND IN BOOK]



[ITEM FOUND IN BOOK]



Notebook, N-04-10-21.2

This notebook covers the period October-November 1904. It contains various hypotheses proposed by Edison to explain the loss of capacity in storage battery cells. Many of the entries include results of tests of these hypotheses. The front cover is marked "Edisons Book." The pages are unnumbered. Approximately 130 pages have been used.

Theory No 1 Oct 21 1904

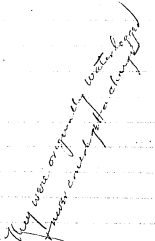
We have found by looking over the past records that the C cells in the Rogers Auto + also in Madelaines Auto never lost their capacity - Rogers Cells after running over 2500 miles in the Studebaker endurance and then at times afterwards + when tested gave practically the same ampere Capacity - the same with Madelaines. The only difference between these C cells and D + E cells is that the Nickel plates were washed. Electrolytically by putting 50 amps on each single plate for three minutes in KOH, the effect the 5.5 gram pocket swelling from 125 to 145 - = [Note ascertain if Iron was also treated in this manner] yes Iron treated same way both put in water + afterwards dried in oven -

The Theory based on this difference

Wrong

in treatment is that the powerful rush of gas produces channels + swells the pocket 17% before the nickel itself has time to swell. and these channels are always maintained permitting egress of the Current + KOH for the necessary reactions. The swell due to the nickel itself is small as evidenced by the small swell when a pocket is immersed in KOH for many hours - hence this swell can never be sufficient to perceptibly close the large channels made by the powerful gas rush from Electrolytic washing - and subsequent swelling is prevented by the original channels permitting an easy exit for gases without causing any internal rise of gas pressure.
Even 33%
In favor of this theory is

1st pockets of the same kind on test as a rule those which in 20% KOH shows the greatest swell give highest output –



2nd In a test of 2 Cells from the Studebaker wagon one good the other bad – no other difference could be detected than that all the Nickel pockets of the good cell had swelled 10/1000 more than those in the bad cell – although the weight of Ni mix was the same – and that the mix from 6 bad pockets dried & put in new pkgs gave original Capacity Evidently for some reason these pockets did not swell hence not enough KOH got to certain parts to permit formn Ni_2O_3

If the Ni returned to original Capacity in new cups it must have been partly out of Contact somewhere in old Cups – or stuff had swelled by gas but pores closed so much that not enough got in to swell it –

In searching old records found this is true in every case where reverse was tried before charge reg— they also maintained their capacity + gave high results— All reversed cells show higher Calliper The question is should the gas evolved be made by heavy Current for few min on positive plates or Normal rate longer time, Test cells were run with moderate Current 24 hours —— Is not the C rate but heat + Current

This explanatory Rose fouled with years of the test got high enough rate to heat

3- JWJ says that there were a number of small cells that he thinks a number of small cells were reversed before running at normal + he thinks some at higher rate + that these cells were the best small cells he made.=

This may be applicable to Electrolytic action theory as well if on investigation of the old books its found that the rate was low— How this proves nothing except records show these cells run for long time without going bad—

4= In favor of electrolytic action of K ion + migration of some radical out of Ni on reversing is that a cell having its Ni plates reversed against the can at normal or ordinary temperatures for only 10 hours improves it 9%— and

154
8
1216

later test on 12 amp for 33 hours reverse 150° Fahr improved it 20% when the original cell was not so badly down as cells in gage apparatus

NH_4 added seems to improve all pockets in old records,

perhaps it changes the sticky of MoH_2 + graphite so not covered with a film or it acts on some kind of [illegible] salt like 33% does

the same kind of cell reversed half 170 deg Fahr improves in 10 hours at normal Reverse charge 22% (another in cabinet 150 deg gained 25%). However as the improvement is not great as the increased volumes of gas due to using Hydrogen its equivalent to double normal or 150 rate on Σ 45–50 it may be gas opening of porosity – after all.

5 In favor of porosity Theory is the fact that pockets containing NH_4 Cats + Valadized out thus giving porosity of a certain kind gave high capacity per gram of nickel. The records may show if they lost capacity

Capacity originally given may be due to increased porosity but loss cap may be due to another cause,

6= Another thing in favor of porosity theory is that Ni runs very high in 33% because the swell is great but owing to the great softening of the Ni by 33% it gets mushy and the internal gas pressure rises very high + the swell becomes to great for the pocket and there is a loss of Capacity=

7= It might be that radicals were thrown out and the gasing gave circulation to carry them out or inert matter, The fact that heat in addition greatly increases the rejuvination will show that KOH carried in decomposed with the heat the Chem

Combinations + the products were forced out by the circulation set up by gasing - or as Radical ion

8 = Another proof that the loss of capacity is due to chemical action on ni is that we charged 2, 2 18 cells 5 hours at 40 - and discharged both through a constant resistance. One No 2742 was a new cell out of Reg Stock giving 165 amph on reg long charge at factory. The other cell was made up of plates taken from an E 45 which was in use 1 1/2 months in a 4 1/2 ton truck, Herbert Coal truck - No 2392. The total amperes of new cell 138.43 of bad

Note, the channels leading to a portion of the nickel may in our cell be so closed that there is not enough K ions present to permit the formation of NiO_2 even on a long charge. A little may get in gradually & thus might explain why excessively long charges increase the capacity - possibly not enough ions in portion of NiOH present possibly if the electrolytic washing could make plenty of channels so they could never be closed by swelling of the mix there might always be sufficient K ions present in all parts to permit whole to go to NiO_2 hence overcharging not be necessary & great output + economy be gained

Cell 87.73. - Average amperes to 1 V on good cell 32.7 on bad cell 34.18 showing that there is no bad contacts or internal resistances. but that a portion of the nickel is absolutely unaffected by the OH ion, that it must be combined with something Chemical, for KOH cannot get to it. were the pores clogged the amperes would have averaged less whereas they averaged more than the good cell. It is unlikely that by swelling of the mix certain particles were shut in from receiving any Current, a Current would pass between two leaves of graphite by the film of liquid between them with pressures far in excess of what there is in the pocket. + the high resistances of these films would show up in the average amperes but there is no evidence in the Curves the Conclusion seems to be almost

Can be explained by absence of
Enough K ions to reuse mix to
$Ni O_2$ = Can't force the Ni ox
when charged into a non conductor

Another thing in favor porosity is that a run cell - if left standing long while gives on 1st charge a greatly improved run which on next run is lost, KOH circulated into closed spaces — or rather goes into pores of individual pieces!

The graphite was not covered with a film of NiOH

The Bismuth results may be due to great original porosity as it is the only known mix we can't get graphite to stick, hence it deducts flakes - We had another peculiarity it made the most smelly solution in 20% unlike any other Combo

irreversible that the nickel combines with something + becomes inert + absolutely dead and that Electrolytic action in the reverse direction, forced and under heat conditions which accelerate it, destroys the combination from the fact that Electrolytic washing as practiced with the old C Cells Caused them to remain constant the inference is that this chemical is in the mix originally + that Constant Oxidation Causes it to Combine slowly — we know that we do not get more than 60% of the Capacity of the nickel any way is this must be due to chemical ~~or Electrolytic~~ Combination, as for instance action of 33% of Bismuth. possibly if the original Electrolytic Cleaning was modified from 50 amp & 3 minutes to 12 or 15 amp or even

less in KOH at 150 for 20 minutes more or less that the whole of the deleterious Chemical could be removed & this cell not only never recover but the original Capacity Greatly increased, in any event there must be some ampere rate time + temperature which without undue sweating will bring about a good recovery think 20 amp on E18 for 24 hours will do it possibly 48 hours heat 150 F to 175 —

Note, possible chem combns with the $NiOH_2$ in mfg - which are decomp by K low or hot KOH

CO_2 Co FeO Fe_2O FeO, Fe_2O_3 - Ca Silica amper, Silicate, Mg Cu Pt Ar NH, N, SO_3 Fatty acid, Organic substance

oxidizable to an acid Titanium hydroxide
$ZrOH$. Ce Mn Cr Wo - Mo Zn
Ta Di. Niobium Parsody Fe_2OH.
Argon Helium Neon Crypton Sulphides.
$KFeS(OH)$ - Oxy of - oxy Br etc Phos
Ba $Ni_2O\ Ni_2O(OH)_2$ Peculiar combination
of two Ni hydroxides - Polymeric $Ni(OH)_2$
2 Hydrates combined together, $KNi(OH)_2$
decomposed only by K ion at high density
+ heat, Double Salt, $K_2CO_3\ Ni(OH)_2$
or = $K_2CO_3\ 3\ Ni(OH)_2$ = Glucinum -
or Na_2CO with $Ni_2CO_3\ 5\ Ni(OH)_2$ -

Note Copper has a basic Carbonate
with $8CuO - CO_2 + 5H_2O$ - which shows
possibilities of combination,
also $9.Fe_2O_3\ CO_2 + 12\ H_2O$ -
$3\ Ni_2O_3\ CO_2 + 5\ H_2O$. but of varying composition.

Note = A strange thing is noticed that the Ni mix removed from old pockets which have been exposed to the air at Glen R factory for a long time, were removed by the tearing machine + the whole lot of it was found to be very inactive, + no good - so that is now on hand + cannot be used. Again JWA discovered that regular Ni mix which is comparatively dry will when exposed to the air for many days absorb something H_2O's, presumably up to 20% + still appear dry + feel dry — Was it free water, or did the water all enter into combination, or was some of the weight increase due to Water, CO_2 + some unknown ingredient It seems incredible that 20% H_2O could be absorbed without rendering the Mix sopping wet. ? — perhaps ~~the~~ of it is water that it combined with

the NaOH chemically which would account for the dryness — + perhaps. A plate with NaOH with the water once combined is never seperated after it once goes into the KOH, but can be by heat, ~~or~~ heat and high current producing ~~H~~ ~~gas~~ ~~or~~ KOH Concentration.

We have just taken off an E 45 — which originally gave 450 — To 110 — on Return from Coal Truck it was on 1st run 287 — to 165 — 2nd Run at 9 per R 300 — then they reversed it to get more OR look out of Can washed it, put it in new can sent it to Lab — We put it on Steam bath on paper 24 hours. 62 Centigrade — The KOH had been poured out + Water only put in — then after 24 hours poured water out + put in Reg KOH.

But probably it would have improved much more if 20% KOH had been left in instead of filling with water — as the Chem Comm is more likely to be destroyed with strongish KOH

With smooth die Brittle fracture of steel is not broken up but Corrugating die breaks it into small grains — gives better Carbides

then chgd 24 hours at 100 – it gave 360 to V 361 to 75 –
There is apparently little improvement because the cell before Reverse was on 2nd chg 300 + as it was required to get from OK this of itself would improve it 30 to 40 – Its stuff 90 amperes short, improvement was 17% –

Oct 21 1904

It is evident that contact between the cup and the mix and within the mix plays an extraordinary part in the total capacity of a cell – If we take a pocket with the regular amount of mix in it + press it flat only with the regular pressure we only get from 30 to 40% of the capacity because the mix is uneven in the cup + also there is no spring pressure on the Cup + it can only press very lightly

This has to do [illegible] th original Capacity not [illegible] ness of Capsule because reason [illegible] a 9466 E45 flat plates by 50 a[illegible] 20 mm 150°deg dulent overall thi[illegible] in the elevation Hence loss capa[illegible]ty due to poly Chemical reasons not Mechanical

on a few spots, + these spots being hard by reason of greater amount of mix in line with the pressure, swell up higher than the adjacent parts + remove the flat pocket face entirely away from contact with a large part of the surface — If we use the smooth Concave die we cause a slight flow to the mix + the concaving of the steel gives a greater spring pressure hence there will not be so many warts or high spots + we get better face + internal contact + we get in consequence from 50 to 60% of the Capacity. When we corrugate then we have a great + powerful flow of the mix which tends to even it + the face of the pocket becomes a far more powerful spring an arch spring so to speak enormously stiffened by the

relatively great corrugations but even this will not correct very irregular filling of the pockets. When we have a cell with Evenly filled pocket the cell is high capacity. and any subsequent loss is due to some chemical action, or closing of pores by swelling of the mix. with Everything in favor of Chemical reaction, for loss of equal Cap

Took old D Cell 2V - that was bad -
Chgd 12 hr cold 60 amp - put on hot plate
66 Cent, 12 hours, poured out KOH,
put in distilled water put back on
hot plate 6 hours, poured H_2O out
filled 21% KOH, Soaked 5 hours not
on hot plate, charged 24 hours
60 amp - discharged at 30 - amps

Note that the cell is not improved as much as the one ran 12 Chloride cells for 33.3 hours at 1160 fahr - only 400 Reverse Amp put in Where Cell cut off reached 60 amp 12 hours or 720 amp higher rate - but shorter time

127.5 to 1 Volt 132½ to .75,
Originally gave 119.5 to .75 114 to V.
This evidently makes no improvement as the long charge + heat would improve it this much, so nothing Comes out in hot water to improve the cell - and the Cause of the increase of the E 45 previously spoken of which was also on hot plate Etc Etc
Reversal given by Hand to make non polypropionic —

Another Cell - ran 120 to V. 122 to 75 -
Chgd 12 hours at 60 Reg -
Then charged 7c against can 4 hours by mistake, then found mistake + reversed N1 against Can not 70 Cent 12 hours 60 amp - Then put N1 Reversed against 7c for 6 hours then changed KOH, Chgd 24 h at 60 - discha 30 - Rem 139 to V 141.5 to 75 - This improvement due to Reverse

Remember that capacity is one thing + a loss of Capacity after it once attained is probably due to an entirely different action.

Here is item tending to prove beneficial effects of reversing is due to porosity 1069 of aPd book shows case where Cap in 35% 45 gram went to 720- + then KOH changed to 20 + it kept on + got even better - same rate discharge although Cap per gram not great or better than Reg. This may not be a good citation as Nb_2O_5 used dehydrated at 450° — a better Example is 635 This is fine illustration - the porosity left by 35% - added to give very high results after Changing to 20% even 3 Runs after, in fact results are highest yet for 20% - possibly the 35% removed Something + its not the swell — or it Caused better Contacts

8 NiOH$_2$ + 2 Ammon Carb 2 graf
made regularly on heater
Orig 124 140 141
12th run 169 157 158
129 49 swift —

Moth bulky

Its NiOH screened thro 200 mesh -
NiSO$_4$ weighed out part together + wet thoroughly
High Carbon steel Cups
dried 4 hours —

did the NiSO$_4$ CO present formation of film of graphite or did it act as a solvent to dissolve some off so makes graphite get better Contact —

Also BiOH pp with Ni makes green Ni
so it softens as much as 20 as it does without it in 33 —

This looks as if some chem filled pores of the NiOH particles small as they are + protected + pores of KOH + these stuff came out on discharging that as was originally in + swelled by chem action -

33⅓ weakness softens Ni while it don't - hence 33⅓ gives do highest Capacity not from single inherent as good best from Carrying KOH in greatly strengthened chemical solution as in

Notice Next 748 old book Next.
3.32 grms Ni mix in 35% gave about 1043 — on 8th charge near that on subsequent charge discharge rate 150 —
This is highest capacity I have yet found is equivalent to 1054 per 3.4 & 18 now made or 303 amp per Cell — or 378 watts. or 1.97 cells per hph — or 246 lbs per Horse power hour — 748 - had
2 ammonium Carbs 2 graf — 4 grms dry
3.32 dry mix — dried on heater ? (Why —
The same amt of Carb can put in paste with graf - made Reg dried 47 hrs in 35% - evident gives the output — This would go to prove porosity is what wanted see 768 — 767 —
possibly the porosity is essential Not to get the current in because — that would go in on the films between the grafite no matter how close they were pressed but for another reason not enough KOH to permit NiO_2 being formed

140
10.4
3.6

The new plates 50 amp for 20 minutes instead of 3 min in Cold KOH, which got 10 deg hotter than temp room gave an average swell of 14 or an increase swell by reason of the longer time of 3.6/1000 -

Gubbs plates once swelled do not swell any more by 50 amp 20 min 180° Fahr —

I fund averages Calliper new dry nickel plates · 89.6 — Center,
Swells by Electrolytic wash 50 am 3 min to sufficient to produce an average swell of 10.4 1/000 —
plates taken from Gubbs & 45 bad cell showed averages swell to 107 1/000 of original was 89.6 — then the average swell of running is 17.4 - or only 7/1000 More than the swell by Electrolytic washing - 3 minutes at 50 amp on single plates,

Oct 22 1904

It is possible that by heat or longer reverse change or higher amperes that the Ni could be swelled 17 to 18 + thereafter no more swelling would take place and there might result some surprising results giving higher economy - possibly

more capacity, it is even possible that 33% might not material increase this swell thus we would not only increase capacity prevent loss of same but cells would stand winter temperatures better.

I understand Hess to say that Reversing against the iron instead of the can dont improve the cell, like it does when reversed against the Can, we know it dont hurt the iron to reverse it as we do that to prevent self heating, this looks as if reversing is to bring back capacity was a chemical effect because it should work just as well with the iron as the Can if it was forming porosity by over gasing. now why

dont it improve when iron is connected the only Explanation is that the iron is an anode + returns back to the nickel the deleterious material on long Charge, if so what is this material is it iron ions, or what or is Theiss mistaken we should try it on a bad cell — if Fe ions dont see how reversing Ni to can will remove them as to Cathode —

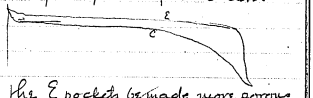
The E45 Gibbs battery plates which had lost capacity was Calipered + then treated reverse 50 amps 3 minutes single plates. They did not swell any more, is this against porosity theory perhaps they will not run any better,

Doubtful

Possibly Chlorine prevents the Carbon with the NiOH films of the deliberate Chemical or prevents its dissolubility or Carbonic with it to make it very unassemblable

Perhaps the chlorine radical is important in forming NiO_2 as on Charging the CP constantly migrates to the nickel while K goes out until finally there is a considerable KCl there + by secondary action we get the hypo reaction, Br would act also but Iodine would not and Iodine hurts the nickel a very little CP is necessary as it acts catalytically merely by presence.

There is no doubt but there is internal Resistance or lack of mix in the mix, witness the gradual fall of voltage in C Cells



Could the E pockets be made more porous or bitten Colloids

If every particle of NiOH was in contact with clean graphite there should be scarcely any drop of voltage shown from 1.35 average

The fall of voltage would be even less, ~~The~~ it is possible to get the voltage around 132 instead of 125— this can be brought about by porosity - only not by better contacts this is shown in lead cell where if discharge too rapid there is a great fall. due to lack of circulation of the ions to perform the proper reactions

Theory that iron deposited within Nickel mix is cause trouble

On discharging the iron in the Electrolyte is deposited in the plate also on the graphite within the nickel pocket On Recharging the iron so deposited is peroxidized. ~~on Recharging~~ and the iron ions from discharging that went into

Examination of mounds of pockets shows no iron microscopically under Candle as few weeks (?) show it, possibly H$_2$O unsafe for this,

Solution is plated back on the iron Electrode but some is not plated back + its thru small amount in the liquid within the pores of the Nickel that gets depolarized + peroxidized If the battery receives a long charge possibly the cobalt of the iron would be plated back from the Nickel to the iron. Therefore there is in moderate charges a tendency for the iron to deposit on the graphite & C Co & pores up On Reversing Ni against the Can almost of the iron is reduced to metallic state + any that is not below conducts + peroxidized thereby destroying Contact is now made metallic + a conductor restoring Electric Contact with the Ni OH, + we get improved capacity but of a short time by peroxidizing

The good effect is destroyed & the cell quickly goes back. If this theory is correct, it will be necessary to stop the iron from going into solution. The reason it does go into solution is probably due to self heating & formation of a hydrate, which is soluble in KOH in presence of traces of organic matter; possibly if the iron was reduced at high temperature so there would be no necessity for self heating. It being non pyrophoric we might get it in cell & thereafter the products of the reaction would be anhydrous — or H_2O_2 could be used in the distilled water to constantly throw it down from solution. It would be an interesting Experiment to take a 24 Iron pocket plate & put in KOH against a Nickel

Seems to deposit as spongy & make bad contact if any as there is a yellow oxide to Ni

Sheet 552 how much iron was plated over and if there was a limit to the plating. by renewing the sheets, it is likely that radicals CO_2 etc in the solution would by acting on the iron Continuously act to hydrate the iron & thus render it soluable Possibly the iron deposited with the nickel on the graphite forms a ferrate & could be got out by Circulation. but this want explain Beneficial effect of renewing the nickel-

Can it be possible that the metallic iron deposited on the surface of a nickel plate on discharge. acts as an active Electrode & Exhausts the Ni_2O_3 while discharging - or badly plated pockets permitting porous Ni plating & the gradually formation of active iron material of the pocket

Doubtful as Fe hasnt the voltage to deposit Fe against the polarization of the iron surface.

But it could deposit iron on the MnO_2 itself ?!? - + within the pieces of MnO#

itself - Lately we are washing the plating & its going on very thin & I notice large numbers of black pockets when Ni Reversed showing Iron oxide was reduced to black now & as all of this would be intensively active it would reduce a large quantity of the MnO_2 - Thus again charging is peroxidized & rendered innocuous, but on discharging it becomes active again & make local action between Fe & MnO_2 - This continuous action will evidently increase with age & it might explain fall of voltage on discharge - The remedy would be thicker Nickel plating - I think C Cell cups on account of thick swelling pockets were heavily plated with nickel - There is with 4 grm iron pockets which would discharge the Nickels in E18 - 576 grms of Fe

The weight of all the Ni cups was also 5·76 grams if 4/10000 was active it would reduce output 10% but as its all active + probably 1/4 grms from mix is only 1/2 active it would account for 20% —

To prove this a test pocket with neg iron cored 6z used and a block ni pocket cut out of a plate and put in Cathode for some time cored 6z hung in Cell + connected to the Ni 15 sec of Total Capacity of Ni pocket was demonstrated —

There is another difference between C Cells + D+E - The grid is of thicker metal, The pockets were made from briquettes consequently got no organic matter from handling —

Perhaps with a bad plated pocket. owing to bad contact between carbon & iron that the iron is gradually changed at the surface inside the cup between the graphite Contactor pocket and getting peroxidized puts it out of Contact - by reversing its made metallic iron & Contact is ok again for a while -

The Chlorine radical in excess of KOH. will not attack an oxide or if KOH in quest Excess will it attack Compact iron or nickel but will attack porously deposited metal giving the Colloidial flocculent hydroxide secondarily by action of the KOH on the Metallic Chloride hence the tendency of chlorine would be to remove all metals which iron could deposit within the mix on discharge such metals which

are lower in the series than now
like Copper, Lead Bismuth Silver,
+ others – possibly the conductivity
of cells with KCl added to KOH is
due to this action.
We shaved rusty some little cells with
oxides of these metals also dissolved in
KOH, to see bad effects.
Cl radical attacking Ni only makes
in KOH green hydrox + not Ni_2O_3 –
It attacks a Sulphide.

We took an E 18 made up of plates
from the E 45 Gibbs coal truck that
had gone bad and to prove if the
good effects of reversing against
the can was due to Hydrogen
gas in excess opening the pores
or to Chemical action of the
K ion or throwing out radicals

Reversed
02 ~~Discharged~~ at hot 160° Fahr
12 amperes only for 33 1/3 hours —
This certainly would make no gas.
Any effect would be due either
to action of KOH Concentration, or the
R ion acting on something, or
the throwing out of radicals —
The results prove that its not the
Effect of gas, but Chemical
or concentration
The Cell is nearly if not fully
back to its original Capacity —
Discharged at 30 amp gave
150.7 ~~ft~~ to V. & 152. to 75
it was charged Reg after changing
KOH. in same Can 24 hours at
40 =

Here is a new theory - Heretofore we have only spoken of porosity between the particles of the mix —
But to have the $Ni(OH)_2$ active each particle of $Ni(OH)_2$ must be porous itself and sufficiently so to permit entrance of enough KOH to permit of peroxidizing the $Ni(OH)_2$ otherwise there is no possibility of oxidizing the interior. We know that 20% KOH does not swell the particle but very little hence there is a limit to the KOH which can get into the interior evidently it is so small that there is never enough to afford Hydroxyl ions to form the whole particle to NiO_2 hence we get a limit to the capacity.
Now 33% KOH will soften the $Ni(OH)_2$ & it will swell & expand opening

the pores so that not only is there more KOH going in but the solution being stronger gives stiff more. Then there is enough hydroxyl ions to cause the whole of the $NiOH_2$ to go to NiO_2

Now the only $NiOH_2$ that will soften + swell in 20% is a hydroxide containing Bismuth, hence Bi Nickel permit more KOH to enter the Center of the particle and we get highest capacity known in 20% but it is never so high as 33% for the reason that 33% makes a slightly greater swell + in addition there is more KOH in it,

Now if this theory is correct, loss of capacity in 20% is due Either to the $NiOH_2$ particle shrinking and diminishing the amount of KOH going in.

or its due to clogging of the pores by inert matter or to a chemical combination diminishing the pores. a dehydrating action causing shrinkage, or some substance deposited in pores a having diminished solubility. or iron dissolved in the KOH getting in pores is peroxidized and cant get out – or Mercury oxide or any soluable oxide the monoxide of which is soluable and the higher oxide is not, to the presence of radicals combined with the surface of the pores or rather walls causing the diameter to diminish or those close or partly close the pore to resist ingress of KOH, or a sufficient quantity to effect complete reaction,

Now if this is correct what action

Takes place on reversing a nickel plate or cell.
1st We can have no ionic electrolytic action after the cell is discharged because the $NiOH_2$ particle is not a conductor, we cannot force any inert matter out of the inner pores because there can be no electrolytic gasing within them Consequently neither ionic radical or inert matter can be got out, this way and the only imaginable way to clean the pores is by heat & concentration of KOH within the pore as far as possible, so that the radical combination is decomp by the hot conc KOH + the gassing on the graphite providing exterior circulation to carry off the products outside of the pockets as the decomp in a chemical way

Now as the pores are infinitissimally small, it will require time and heat with sufficient amperes to give a high KOH concentration, + gasing enough to give circulation Exterior to the $Ni(OH)_2$ particle any more current is unnecessary possibly the KOH left in the cup after the operation would contain a large proportion of the radical If done in the regular cell as the proportion left in is a large part of the whole, hence To remove as much as possible of the deleterious matter, the operation should be done in a large amount of KOH, so the proportion left in the plate will be small, or if done in the cell. The KOH should be changed 3 or 4 times during the operation

Can the contraction by cold of the $Ni(OH)_2$ particle in the winter to close the pores more be the reason of diminished Capacity?

If in the winter the Capacity of the cell enormously deminishes it is improbable that its due to mechanical contraction & therefore its entirely a question of KOH if change. The temp of KOH has such a powerful effect then the excess or lack of it in the pores should produce great Variations

possibly the high concentration of the KOH is not necessary but only heat + passing the diffferous substance may be more solvable in 1% KOH than 20% like a sleparate We know that heat is highly beneficial because when reversed cold they must get very much more heat than when not reversed + charged regular. The high rates that were thought necessary was only due to fact that high rate gave more heat and it was the heat after all that did most of the work. from the small improvement which a 10 hour reverse cold with normal amp discharge only improves 9% in Capacity whereas with same current & time but with KOH at 170 the improvement is 22%. it shows that most of the

improvement is due to heat of course circulation of the internal KOH is necessary to carry out the products of course there is KOH Concentration

Now heat dont swell the pocket even on an old plate Reversed with 50 amp 20 Min. at 150° Fahr gave no swell. therefore it would give ~~Mass~~ no more with a very weak current as instanced by the Cell that improved the most to wit the one with 12 amp on E 18 33 ½ hours at 150° Fahr. Therefore the only conclusion is that the deleterious salt is deposited in the fine pores of the individual Ni OH particle and that it is slowly soluable in hot KOH, + if the internal gasing is sufficient to Circulation in the graphite channels it is only a question of time when

Standard Ni-

1st Chg	38 hours	200	run 100		492
8th	14 "	"	"		500
117	15 "	500	"		489
118	15	"	"		477
119	63	"	"		473
165	45	"	"		554
166	15				465
167	15	"	"		465
319	41	500	"		493
320	15	"	"		370
321	15	"	"		392

3.12 gms

3.1

Another Cell.

165	42 hours	Chg 500	dis 100		500
166	15	"	"		437
167	15	"	"		440
319	41 hours	Chg 500	Discha 100		331
320	15 "	"	"		307
321	15 "	"	"		300,

~~Another~~

See 2 pages further—

the whole of the substance will be dissolved out of the pores, thrown into the general grafite system— Circulated outside to the KOH.— then removed, Now the question arises, what is this substance, and where does it come from.

If it is true that KOH improves the (10) prevents loss of capacity, then the only way that I can see how it would fit the theory here set forth is that it goes into the pores on Charging & forms an easily double Salt which therefore cannot accumulate,

I notice that in small test cells: when they come off of a long test the first reg discha is higher (very much) than the 2 following tests, acts as if shorter charging hours give worse worse results. but 1st charge often Comes off Grumy generally a long charge gave finest results

Another Theory –

That owing to difficulty of making contact between Carbon and metal + carbon + carbon some substance is gradually deposited on the surface of the cups + between the grafite. That known portions of mix out of contact with high disch rate larger amount is known out by excessive gasing at surfaces of Contact the gas interposing between the Grafite + the Cup.

To sustain this oxydized cups give with 100 disch rate. 485. + only 92 at 500 rate. a loss of 82 percent. in this case the rough surface of cup caused heavy gasing + forced mix out of Contact. Now in regular cell. Something is deposited on inner surface of the Cup + a reverse current hot

Removed it

Small cells continued —

2.7 grm St M - chg 200	rem 100	38 Hours	417	1st chg
2nd — 500	" "	41 "	445	319 chg
2.8 grms	chg 200	rem 100	38 hours	425	1st chg
500	" "	41	447	319 chg
2.9 grms	chg 200	rem 100	38 hours	447	1st chg
500	" 100	41 "	438	318 chg
3:1	chg 200	" 100	38 h	475	1st chg
500	"	41 h -	331	319
3:2	chg 200	rem 100	38 hours	492	1st chg
500	" "	41	493	319
3:4	chg 200	rem 100	38 hours	523	1st chg
500	100	41 "	460	319

Here is a valuable record. These were 2 cells taken from Studebaker Independence run battery one good the other bad — The good one calliperred 10/1000 longer than the bad one.

Bad cell. had pocket cut out + tip put on + run
~~Chgd~~ Reg discha 75 rate

317
265
295
303
279
347
244

422 — Reversed 24 hours at 500

Mix choked = not pores of $Ni(OH)_2$ pieces —

$Ni(OH)_2$ mix taken out 6 pkts not washed, 3:2 —
chg Reg discha 75

391
491
483
388
516
448
457

453

Mix is OK —

Good cell pocket cut out rung Reg
75 rate. 463
457 Mix OK.
400 -
440

This is very confusing. why didnt the good cell get bad -
again. putting the same mix into new Cups brought it all right again -
Reversing the current did the same thing
Can it be possible that the yellow
Color on all Ni plates is a film
of Oxide + that it is inside +
outside the Cup + on the graphite +
that it is either a non conductor or
a poor one + that heat + Current
reduces it only to have it formed
again, if this is correct why didnt
the good cell go bad, it may be
only on the cup + is yellow Ni Sulfide.
The bad cell had more sulphur

Coming out of rubber than the good one & it might have been only a question of time when the good one would have gone bad, from sulphiding of the inner nickel surface. If its is NiS its anhydrous, and our previous experience is that it cannot be oxidized — now what does reversing do, can it reduce it this seems improbable. If it is an oxide it possible could be reduced. If sulphur Cl ion would probably oxidize it by double decomp Br also but Iodine not because HI is endothermic in fact iodine might combine with the Nickel. Experiment to see if a yellow pocket will have its color discharged by Reversing that & then recharging or cleaning — also

Experiment to clean the yellow by reagents that will determine if it is iron Sulphur Ox of Ni or what? —

I think NiS is a conductor if in very thin films the resistance might not be noticed but as time went on the film would grow thicker & Creep in between the graphite & the Cup. I am not sure if Sulphur itself will not deposit on Nickel & also on graphite from a K_2 Sulfide —

Notice in Good cell test pockets cut out. That Reverse 12 hours 5% hotplate is this.

282
265
295
365 — Reverse 5%.
367

Rev 48 Hours 5%.

255
260
370 — Rev 48 in 5%
355

Best when reverse is in 20% we get
242
247
422 - Reverse 48 hours 20% -

Showing great improvement in Strength KOH,

Oct 25 1904

One of the Ni plates from a 6ad E45 Gibbs coal truck was made Anode in 20% KOH, against piece of Can. It was quite black. firmly adherent, full stream of water falling a foot made scarcely any impression on it. Weak (hand washing) acid would remove it on some pockets which were taken out but with great difficulty from other pockets - After the removal of the black deposit the old light yellow color was off on the pocket There is no doubt that they are different from different cause. it can be

seen when the black deposit has become detached that it has an appreciable thickness & is extremely adherent, what is this substance is it iron or iron & other things — from our experiments in cleaning by ~~[illegible]~~ it may be that this skin is burned off by Hydrogen & that is what makes Cell come back - but how about the 12 amp 33⅓ hour cell that come back - possibly this is explained by the fact that 12 amp gives sufficient gas when not a time is given to loosen the scale -

It would be important to know if the yellow scale under the black deposit can be removed by using it as Cathode —

It may be that there are two things going on - one bad thing originally in the mixix which is eliminated

by hot reverse for many hours using a nickel wire, and. Reversing a nickel cathode has iron deposited on it by reversing a cell to get the iron group iron pyrophoric, in the 1st Case if Ni is never reversed with iron as anode it may never go bad. but if it is reversed after iron has been deposited it will come good for a while but soon go bad as the scale is either reduced to Fe or its torn off + the original impurity in the Ni is deposited to make it go bad — in any event this deposit of a film on the inside is very bad. — Latest Experiments show that by putting 1/2 pocket in KOH + sugar hot also $CuSO_4$ with free H_2SO_4 that the black

film on the inside of cups is discolored off showing that its Ni_2O_3 that gives the black color & produces the film at least its solvable in NH_4 salts The product in KOH fusion is not so bright as the $Ni(OH)_2$ is on it — There is no yellow color inside — outside is black blackish showing now or something not solvable in NH_4 + its salts or reducible by sugar — As we know Ni_2O_3 is a conductor there is little danger of its something else + not a conductor it would be bad that its not now removes a great danger — Now had did this very adherent film get on is there a very thin layer of $Ni(OH)_2$ left on the graphite in rolling with KOH in Chilean mill

this is very likely in fact almost certain to be the case this would stick to the cup + when mix came out by taking cup apart it would stick to cup + not to graphite rod that is too smooth —

This would prove that there is no actual contact between the graphite particles a very thin film of $Ni(OH)_2$ or Ni_2O_3 OH interrupting - if this is the case the cell would be greatly improved by either rolling the mix with an extra amount of rather fine graphite in a tumbling barrel + covering the outside of each particle with graphite that has no film on it possibly it would need a slight amount

of moistening steam for mixing while racking – then the Current could go to all parts of the mix by metallic Conduction & cure should have no fall of Voltage whereas now if the film theory is correct, all or a majority of the Current passing to the mix must first make a chemical reaction from MnO_2 Zn + through progress slowly through and inferior Conductor –

Probably a mix of 8 Mi 1½ graphite, Then finally ½ graphite added in tumbling 66# –

I notice that in little book wherever pp graphite mixes were used the addition of Coarse graphite before cup was made up enormously

increased the output =
Possibly the use of non coated graphite as before mentioned we might not only keep Voltage around 130. but get increased economy although it is difficult how economy can be improved beyond a given point until we increase the porosity of each $Ni(OH)_2$ particle so KOH can get to the Center to produce the required Electrolytic action,
If we use 33 to soften + penetrate it swells cup too much if we use Bismuth it swells also + at same time diminishes the amount of Ni by from 6 to 9 percent
What is wanted is some substance not soluable in Alkali or water that can be precipitated by Alkali + then afterwards put in a special solvent

that will cause it to slowly percolate out without softening or injuring the mucks, + not leave it so porous that it will crumble in the Chilleau Mill – Now what in the substance possibly an Antimony Salt + when antimony peroxide + it would Come out as Antimoniate of K –

Hg O is insol in KOH. its decomposed by Alkaline Chlorides + aq into. $HgCl_2$ which dissolves –

Its also soluable in hot NH_4Cl + aq $HgCl_2$ at 60 Cent dis in H_2O 13%. NH_4Cl dissolves 17 times as much Extremely Sol in Alcohol

Carb Lime might be used ~~as a solvent~~ ~~Carbonate~~, Sol warm Cane Sugar also Sol boiling $MgCl_2$ + aq – Very Sol when recent ppt in $CaCl_2$ + aq + $MgSO_4$ + aq

Lime— very oof sugar 100 pts sugar
dis in H_2O dis 55 pts CaO
Whereas scarcely a trace of $Ni(OH)_2$
dissolves. The Lime & nickel
Could be precip from Chlorides
so NiOH would have 10% lime
& then washed ~~well~~ fairly well
& dried so Lime not Carbonate
afterwards put on percolator
+ NaOH got out & then soaked
in Sugar solution weak until
Removed or it could be dried
so as not to Carbonate &
Then set the $NiOH_2$ & afterwards
percolate the Lime out by
Sugar water

Regarding Swelling -
I notice in B.OH mix with M.OH test, where all were mixed + rolled with water the swell was great. But when 9% was rolled ~~with~~ moist with KOH, it had very little swell - I remember that water would not make B.MOH sticky + all the graphite put in would only mix + acted entirely different from every other mix, how it worked at all we never could see as 80% of the green showed + the graphite was merely a mixture also the mix did not flow in pressing in the die - but the results were fine as well but the swell was too great. after running 20 or 30 times if it was reversed there was

Perhaps the wet stiff chuck to burro + then internal grooving caused Center get muchy at Cups Expanded Carrying a 10/1000 layer of stiff with it

So great a swell that the mix got out Control, but the one wet (9%) with KOH. + rolled didnt run any better than regular. Whereas the other 9% with water gave fine results — 3:2 gave at 150 slaughter rate. as high as 724 + gave 670 on 21st run — Whereas the 9% with KOH. highest 632 it didnt keep up - 44th run 430 the 9% with H_2O moist on 44th run gave 640 =

It looks as if the whole thing was a question of graphite + as the KOH wet one gave very high at one time to 632 is very high for 3:2 9% of cohesh is present + but it didnt swell only 29 — The graphite in rolling got film of KOH all over - about

Whereas the water mount one had no films over graphite as The NOH was absolutely void of sticky - hence the graphite acted as a Conductor direct. What is wanted to make Reg NOH work is 10% of graphite well mixed to cover the NOH as far as possible, then dried & powdered, & then put in a tumbling bbl & the other 10% put in in presence of steam ~~or not~~ to soften ~~the~~ & then rolled to coat the film covered graphite over - Once the right proportions of graphite is attained & method OK should get fine results as to Capacity & very little swell —

Those soaked 24 hours in 33 gave on chg in 21 – 175. To V no grafite.

The reason why the 3% one cracked on reverse at 40th run is that the NiOH had got very muchy from the gassing cracked it,
These NiOH NiOH Experiments shows that very small amounts of grafite will do the work of the Conductive and OK (10) flakes not mountated by films –
Also shown by fact that in a pocket with only green NiOH, it blackens on Charge. .03% away from the contact with cup + probably more than this but days of charging will not Cause it to go further the Res becomes so great.

Possibly Grafite could be got to Coat the NiOH. By macerating it with an alcaholic Solution of some sticky substance + then Electrodes in a Cup it could

be put in alcohol & the substance boiled out in time leaving the cohals of the graffite perfectly Coating the nickel & free to Conduct the current direct to each particle without having to pass through hundreds of thick films of Conducting ~~Ni~~ Ni_2O_3

Substances proposed.

Rosin, Mercuric Chloride. Molasses, ~~Nickel Nitrate not dehydrated so they are Sol in pts alcohol~~ Gutta Percha, Benzol Ceresin Benzol. Alcohol Sol sticky Anilines Bulls S, in Benzol — Ni Chloride Ankley Easily Sol Alcohol —

~~KOH 1 pts to 100 alcohol~~

KOH, Very Sol alcohol.

glycerine alone —

Chl Cobalt Sol alc & Ether

Chl Nily Very Sol alcohol Absolute dry 3pts

Sugar or Caramel thinks is sol in Alc -
Iodide Ammonia very sol in absolute Alc,
100 pts absolute Methyl Alcohol 12 pts
at 18 Cent,

Thioacetates are sticky think some are sol in
Alcohol - get book at home on sticky
+ gelatinous salts, + Ammonia salts,

There may be a possibility of
tumbling the graphite in dry
NaOH, - Especially if in
Mineral atmosphere without
getting any fumes on the
graphite —

Possibly an extremely weak KOH
~~work~~ in alcohol, would answer -
is glycerin sol in alcohol
also Benzol,
1965 = 2% glycerin alcohol burst at ~~two~~ two days
1 cup, warm graphite with 8 changes - also 20 52 - 8% glycerin swelling
therefore glycerin could be used to put graphite on

gl 2059 4% gly

2052 8% glycerin Dry wash 842 washed
Bird Cup - 1 fine grafts.

1st 460		orig 95	99	101
2nd 517	1st	109	107	
3rd 523 -	2nd	103	103	
	3rd -	103	103	

The one 2054 not washed not worn no good

2059 - 4% glycerin 842 matter grafts coat.
washed -

1st	540	orig 89	95	
		1st 95	100	
2nd	555		101	104
3rd	543		100	100

2060 2060 not worn not washed

1st	387
2	412
3	495

5% gly elevated to above Lower poly not
Enough Enough

Abnormal swelling in every case seems to be due to the NiOH going soft and mushy and possibly the gas exits are thereby closed at points and this makes internal gas pockets and pressures and thereby swells the pocket, it seems impossible that it is due merely to the expansion of the $Ni(OH)_2$ itself. Now 33% is the one that swells it most 20% NaOH swells it but in 20% NAOH there are as many ions as in 33% KOH, this explains why NaOH apparently swells it at 20% as much or nearly so as KOH 33% — it has been supposed that the higher viscosity of the 33% was the reason why it swelled more than in 20% — but while this may aid, there is the softening of the NiOH with 33% far in excess of 20-4 it is more certain that this softening is the principal cause

Especially as we know that Bismuth hydroxide has the effect of swelling the $NiOH$ nearly as much as 33% although the $Bi.OH$ $Ni.OH$ pocket is only in 20% Examination shows that the $NiOH$ $Bi.OH$ Nickel when particles are put in KOH 20% soften many which is not the case if the $Bi.OH$ is absent,

Now this coincidence of the only two cases of softening (10 $NiOH_2$ in 33% and $Ni.OH$ $Bi.O$ in 20% and the fact that both run better than any other + both swell the most, + this is true notwithstanding thousands of test Cells made in every conceivable way I am now going to look up the old books to see how the swell was taken a pocket had been run several times in 20% + then run in 33% I found that in most cases the swell very greatly increases when charge

from 21 to 33% - but it dont improve
the run to volt much but the run to
.7 is generally improved -
also of run ~~change to~~ Change in
33% ~~ft~~ discharg in 21% it dont
swell it
Neither does soaking in 33% - 220 -
measure swell in first 2 cent runs
Change it when load one run -
Evidently the swell of 33% is due to
discharge + possibly Concentration
of KOH, as there is no gas on
discharge hence the neat gas swell.
although the softening may cut neat
Charge permit of gas swelling if
Os it dont swell on chg - it is
Either essential to peroxidize the Ni OH
in 33% 1st + then discharge the KOH
33 has a better channel to get into
the Ni OH particle + then the OH
goes out leaving KOH in it

Later results show that by chg a reg in 33% hcl at 175 Fahr & then changing again after soaking 14 hours in 21% chg 15 h at 200 & desch 100 get nearly all the grains above 700 & one went 758 — on next chg they dropped nearly to Reg yet the swell on 1st 9.2 2nd run 11.4 — Therefore it is not necessary to have great swell apparently with 33% although many runs may do it —

place very strong & thus swells the particles so it gets soft & mushy & swells is then time to quit —

Check all goes to show that to get all the nickel a clinch the NiOH particles must get plenty of KOH, & if it does it will get mushy & the swell cannot be restrained. Hence how is it to be done ? ? at present it looks like a stone wall, possibly it only a question of graphite as the Birmingham work seem to show —

The best theory to work on is to use moderately coarse $NiOH_2$ particles as Gouè says in Reg mix & coat these with graphite as large as can with out

Coating the graphite with MOH as is done at present, & thus can probably be done with Glycerine Etc

Notice 1069 – orig 121 135 — 45 dry

167	→ just powder	141	143
206	"	141	143
267	"		
283	"		
305	"		
283	"	143	148
292	"		
462	150 water	145	144
543	"	151	145
720	"	153	145 — 20%
667	"		
710		156	155
		156	145
738		162	149
730		161	150
652		164	152

33%

its MIXXO 729 = 726 Ni_2O_3 dehydrated at 450° look up see what it is –

This is case where 33% prepared it & 20% Kept up the record

Notice that at 150 discharge rate 10% KOH is as good as 20% but at 600 rate, 20% is about 290 to 190 for 10% - several cases 2588 Ali

Notice on 10% that with 2500 gaps 75% closed not much diff. between wide open + three closed Acc. 1123

Notice good performance very little diff. at 150 discharge rate 600 Acc 1214

Note 1287 - Gen Mix 35% 150 rate 733 — of 1299 - 5 turns Reg plated 5000 perf - Loaded here & Crimped & Ready, with Edge grooves good dia - 80 gen mix → + 1229 - 80 mix Crimped & not plated 4½ hours at 200 V 75% 497 at 150 rate - & why

In 1288 the tolals are diff 1288 at 150 R
to 883@940 – while 1299 is 642@655 –
Both have 3 grinding
Result 1288 8th mm 129 111 84 88
1299 8 " 100 92 71 78
both were clyd same rate,
Also see 1302 where 35% dolomit increases
Capacity 2500 Cups per 4½ h 2 wks
35% — see 1362, 1363 – no improvement
in 35% but big result – ditto 1364 1365 –
This seems to show its either
impurities removed by 35% or
graphite, as impurities in 35% taken
Cement towards it if more in 35%
Cannot get in as no action + no power
but the same mix will show a good
+ bad one in 35% —

5000 perf - smoother —

5 667
4 725 — not stuck around Edges but slid out + rewed up pressure
7 485
10 593
15 440
14 482
15 477
16 525

Notice diff between Edges + Center on grade 6 a

Notice 2781. 30/1000 Conc — 18.2 100 Rate
Orig 831 118 — 495 21% -
Sp below req — nature 35 def between Center Tubes —

New observation — I think I detect the fact that if with the same weight the Caliper before running is small the cell will not run high to Volt on 35% but the swell will be high — if the Caliper is high, it will run high on 35%
Confirm this — as at time of 20%
Standardization 1260 ⊙ 1230 approximately plus count —
all 35%

* 1287	Orig	82	87	3 grams		667 to V	150 R
* 1288	"	84	88	3 "		725	"
1299	"	71	78	3 "		485	"
1300	"	74	84	3 "	85	593	"
1302	Normal	67	72	3.5 "		467	"
1363		70	85	2.8 "		440	"
1362		72	86	2.8 "		482	"
1364		69	84	2.8 "		477	"
1365		69	89	2.8 "		525	"
950		132	144	5.4 drg "		1387	"

* 1287 + 1288 are diff — I in being 5000 Cups + the other perf) smoother normal + other 2500 perf — 4½ h planing at 2.1 Volts —

Malice runs & small swells on
some of Spec Ni's. Accoh ok they
are, if we can get the swell down
it will be a great thing & important
investigation —

In "Reg Test" book I copied
a large Number of Reg Tests
Reg Ni swell averaged 3017
Spec Ni " " 37.
Special Ni " " 15.183

The runs of Reg Ni 511
Spec Ni 440
Special Ni 501.

There was 6 Special Ni-all run
very low in swell. —

	Spec Ni 230 imp	swell. 15	Run 489
3158	232 "	26	500
	232 dup "	25	529
3152	233	21	518
3153	233 Dup	24	502
3162	234	17 v	512
3163	234 Dup	16 v	503.
3164	237	13 v	479
3165	237 Dup	13 v	494
3168	238	18 v	520
3169	238 Dup	16 v	497
3174	243	14 v	487
3175	243 Dup	14 v	487

Spel Ni

Low swell is due to large amount scrap mix mixed with Reg - The more scrap the lower the swell. Abrogant ongs the swell depends entirely upon the amount of Soda left in the MoH_2 + the physical condition.

see 3 pages further on

Ni 3223 Spel Ni Mix no

		Swell	Run
	251	39	470
	251 up	26	500
3245	244	29	520
3246	244 Bup	29	500
3253	226	25	522
3254	226	38	440
3088	216	18 v	477
3089	216	19	483

In pulling down a large number of Reg runs various Ni Mixi Regs Center + Edge diffferences with the runs Show that either there is originally 5/1000 between Center + Edge originally ~~[illegible]~~ of 13/1000 there is some diffference in the runs ~~[illegible]~~

Thus

5/1000 original Calliper Edges Ground

	Run	Average of many
5/1000	537	
6 "	511	
7 "	512	+ Medley 8th run
8	509	Comparison Reg Mi.
9	504	Steel Mi
10	503	Gauge Mi -
11	500	
12	490	
15	443	

These Gauges are of less extensive comply die Good.

It looks as if there was a difference

The less the difference of Calliper the higher the run, This is confirmed by very poor run of the very deep Corrugating die 3/1000 -

Notice No 33 Early Expt. July 14 1902
9 rom 4.58 grams 150 rate. 2305 → H V
2 test Mi Can we do as well as this

No 163 - 2900 to V 3585 to .30 Mark
Chg .300 Rum 150 - 6.3 dry 4.38 grains Fg
Fx by H, amg 93 109 107
Mk 110 115 117
There was a Coat of about a tenth on it.

We planned association if it is the view of the Nickel that is effected by Cold weather -
Can do this by Zinc with Nickel & possibly Cu - Cu SO4 + porous Cups, or Hg O with graphite -

List of swell on some of the latest mixes.
Nov 1 1904

			Duplicate
Reg	383 mix No	10/1000	9/1000
"	382	"	11/1000
"	381	8/1000	9/1000
Special	374	11/1000	13/1000
Reg	370	12/1000	13/1000

Following is list of the special mixes on back pages Abbreviated says: You will notice low swells are most all caused by some scrap mix being made into a general mix with some 227 H_2 thinks control of swell lies in the amounts of soda left in $NiOH_2$ and the physical condition of finished $NiOH_2$ (i.e) porosity.

Special mix 191.

15 lb $NiOH_2$.
20 min + 600 CC H_2O
30 Rev + 1200 cc Ammonia + 43 gr Graphite.
350 Revolutions - 600 CC H_2O
75 " 600 cc " + 24 gr Graphite. Swell 16/1000

216 Regular

230 – 95½ lbs scrap Ni
18½ " " ground fine 36% thru Swell.
27½ – " 227 36% " 15/1000
82 " " 227 Big light mix –

233 – 85 lbs scrap
70 " 227 } swell .021 & 024

232 Scrap 156 lbs
120 " №227 } swell .026 .028

237 254 lbs Scrap mix
202 " №227 } swell .018 .016

238 181 lbs Scrap from pocket
214¾ " Glen Ridge
144 lbs №227 } Swell 018 .016

243 188 lbs pocket scrap
100 " №227 } Swell .014 .014

251. Scrap mixer remixed with KOH. dried and reground
Swell .039 .026

244. 228 Ni mix (Heavy mix)
227 .150 lbs 029 . 031

226. Reg mix .025 .038 .036 .023
267 " 039 040
265 " Exept 1200 cc less H_2O used Swell. 044 & 031
266 – " " 600 cc more N_2O with Reg .039 & 041

268 Reg mix Coarse grog used in place fine. swell 044

$Ni(OH)_2$ №s 265 266 267 268 were all made from same hydrate,

Edison Thinks trouble is bad stirring in precipitating in Tanks & not washing enough to get Soda down, also first preliminary washing not always carried to same point leaving in more or less Sulphate & free Na + this on irregular from want of stirring while pp + after wards

and on drying mix is not uniform as to
Contents of SO_4 + Na hence dries diffrent
porosity. + parts will have more or less Na
+ SO_4 + vowels diffrent.
The only way is to stir by power driven
stirrers, and spray in the Na_2SO_4 evenly +
slowly. + Keep stirrers going long time +
Make the washes always under same
Conditions as to water + time, then
try and deliver to dry pans the stuff with
same consistency as to water, also.
should be broken up after it is about
dry + redried so all parts is consolidated
+ all water evenly distributed,
+ finally washed a few % of SO_4 +
Na as possible.

Notice on Stubbleben good + bad cell—
That when bad cell pockets swelled on level
of rough pockets they run good
126D Bad swell.

Original or Cochipen after taken out cell

	1st run	to Vat
82	84	360
85	87	317
87	84.5	354
84	85	337
87	93	391
84	96	388 — 4th run 98 — 457

to V.

Good Cell 123D.

92	93	448
93	94	459

Callipers of Carlson-Edgar
of a Σ 45 thrust from 1½ month 9/66.
truck – Ni – Callipers every 3/6 mo.

Center		
94.5	90.5	82
97.5	94	83
98.5	95	88.5
99	95	87
97.5	95	87.5
99	95.5	87.5
98	95	87
98.5	95	88
98	94	89
96.5	95	89
97	95.5	89
94	94	88.5
87.5	93	87
	90	84
	84	80

93.5	83.5	87
97	89	90
99.5	91	93.5
95	93	94
95	92	96.5
95.5	92	95
96	92	94.5
96	92.5	95
95.5	93.5	94
96	93.5	94
97	94	95.5
96.5	94.5	96.5
98	94.5	96
100	93.5	96.5
101	89	96.5
99.5		94
95		92.5

Edges -

96	91.5	95
98	96	96.5
99	97.5	99
100	98	100
100	97	100
99.5	97	99
99.5	95	99
99.5	94	99.5
100	95.5	99.5
101	96	99
101.5	98	99.5
102.5	99	98.5
103	100.5	98.5
105	101	99.5
105.5	100	100
104	97	98.5

89	96	97
91	98	97.5
91	98	99
91.5	99	100.5
94	99.5	101.5
96	100	102
96.5	99.5	103
95.5	99	103
95	100	102.5
96	99.5	103
95.5	100	103
89	100	105.5
92	100	105.5
	99.5	104.5
	98	103
	98	101.5
		101

Ross Rept Nov 3rd
2 cells Tiffany batteries
replaced one in Reg C Exp Ended
while reg running cell was not
shortcircuited other was in Reg H
this also was not shortcircuited
found out how this comes
about

It looks as if the Solubility of Hg Iodide in KOH and the decomposing of it now formation of Hg in Rep KOH, or the rendering of the HgO less Sol in KOH in presence of Rep KBr to have something to do with the Marked Change by Hg that effects the Mi of the presence of Rep prevents Hg decolorizing + getting to Mi Coherer

It occurs to me that On account of Chemical action the Nickel grid contacts on pole pieces may in some cases especially the outer end may go bad also the packets which may cause side ways action Contact- the sword springing the grid & then they short circuit Make bad Contact this might account for low cells on 1st Chg & Do also after running Couple Months

Sodene would render the Hg Very Soluble & thus would account for Sodene being the only Element which perimantly affects the Nickel

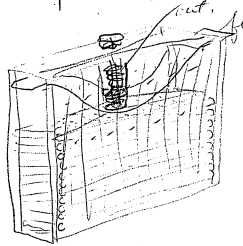
Here is an idea, charge a nickel full, a nickel that has been charged several times, then put in large quantity distilled Water & charge Water many times till Phenolphalein & Benzo no KOH, The Ni_2O_3 will when KOH is absent all dissolve gets & spread through the mix Even then charge cup & Run Reg —

Nov 12 1904

By long use the nickel receives some deposit which causes bad contacts. Some of the KOH going entirely out of Contact while that which is in Contact shows high resistance. Some Cells Come Back OK by Reversing but others do not under Some Conditions. I probably that to get these back the Cell should be soaked clean of KOH + then some Solvent Liquid put in that will dissolve out the deposited Chem. If KOH left in it May be Sugar will dissolve out in great many things. The Fe should be cathoded till all metal of K Succumb does not appreciably dissolve in K Succumb

Nov 12 1904

of the Lyes that can be used when KOH Soaked out is Nitty containing an Nitty Salt. This will attack surfaces of Ni OH + probably make a fresh Contact



Cell off pocket pressed down by spring

Theory

Extreme fine pores in the particles of Green Nickel hydroxide prevents circulation except after days, & not enough KOH gets in to permit a full Charge in 21% but does in 33% hot,

Nov 14 1904

This is probably the right theory

1 = Good cell & bad cell Shredabafer took out mix. Dried at hot, put in new pocket, Came back as good as bad cell in fact better. Reason $Ni(OH)_2$ particles saturated with water, drying out caused KOH go in when put in 21% KOH. hence Enough KOH in pores to permit of a fair Another pocket untouched came back from 244 to 422. whereas the one above Came to 490 - reason is that heating permitted more KOH to go in than in last instance

2 = C Cells do not go bad at Current but very little, Reason internal resistance is high Carriage slop: before real voltage falls below 120 hence enough KO To carry in K ions left in mix

4. Chloride Pot prevents cell from deteriorating except very slow. Reason The Cl anion coming in combines with the K ion going out + is held there is prevented from migrating so it can afford K on the next chg - Any acid radical like ClO - Br will answer except Iodine as that becomes free, + affects the Ni OH.

5 = A battery which has been run considerably is of low capacity if left some time will on being charged give a greatly increased output. Reason Water Conc in Ni OH particles become by diffusion more Alkaline hence will receive a greater charge -

6 In any battery after a long period of use there is generally found several cells which maintain their original Capacity invariably the record shows that these cells gave on the original test very considerable higher Capacity than the others. Reason They never get discharged down too far hence there is always HO ions present to bring in Sufficient K ions to permit full recharge while The others from lack of HO ions get less & less KOH, & capacity to receive charge constantly diminishes what saves the good cells is that the time for recharge is determined by the total output as the vehicle stopping is determined by the poor cells —

7= Discharging a charged battery in the Cold has very little Effect on capacity but charging in the cold has a great affect in diminishing Capacity. Reasons slow circulation + rapid exhaustn of K ions in pores + contraction of same still further reducing Conctn.

8= Reversing hot m. cells recorded in old books before charging in 5% KOH. always improved the run + the Constancy of Capacity thereafter as against a duplicate not reversed both being charged + run in 21% — Reason is that the KOH was electrolytically Concentrated more highly at junction of graphite + heat made better circulation so there was actually more KOH within the pores of the reversed NiOH than in the one not reversed thus permitted a higher Charge Being given

9= Pockets swell enormously in 33 on discharging, not on charging in 33 Reason = on charging if the 33% is well soaked in the capacity will be great if not well soaked in it will not be above regular 21% but on discharg in 33% the H_2O brings in forcibly the necessary K ions & in addition the NiOH is immersed in 33% + the result is a great concentration of KOH in the particle, if there was no gassing the swell would not be much greater than in 21% but the KOH softens the particle & the gassing disintegrates it so that what little general mix channels there was once are now clogged & this permits gas pressures to increase so greatly that pressure is sufficient to swell the pockets, it acts the same with Cup entirely filled with graphite —

B.OH, in the NiOH, prevents it from being water wet, but it softens as much in 21% as req NiOH does in 33% hence greater Cap is obtained, not so great as in 33% because it is in 21% B.OH NiOH is the only NiOH that goes soft in 21%. Excessive swelling is therefore an effect of softening agent.

10= Any Curve which shows the sharp drop characteristics of a good pocket, but which has low capacity only requires concentration of KOH within the NiOH particle to make it full capacity. But if Curve tapers off gradually the loss is due to resistance, bad contact with the pocket, + chemical action.

11= Carbonate Ammonia in ~~same~~ $Ni(OH)_2$ runs better (10) higher capacity. Reason. The fine pores absorb large quantity NH4 gas displacing air + when put in KOH the NH4 dissolves + prevents the $Ni(OH)_2$ particles air free hence more KOH gets in + a heavier charge is possible —
This idea can probably be used
Comely = One of best test nickels made + recorded in old book is —
2189 - Ni ~~oh~~ paste mixed with 5% NH_4CO_3 then made dry mix without water, 84 2 fine graphite. 3:2 grms Reversed hot 12 hours in 5% KOH, same Changed 3 times.

1st run	567	Drop wet mixed not reversed
	602	1st run 355
	612	2 " 325
	667	3 270
	652	
	675	
2nd run	684	

Initial drop 1.5V

on 1st run NH_4CO_3 had not all got out, it gradually did so + more KOH got in - Wet mix scarcely any KOH got in as pores filled with NH_4CO_3 + water. If it had stood a week in hot 21% it would probably have been as good as the other.

13 = Old mix from G.R was found to be so poor in capacity had to be rejected Reason - Had absorbed 20% water which it will do in 10 or 15 Days hence constant be changed as it will be OK if heated 225° Fahr + water driven off —

14= What is wanted is green hydroxide with more fine porosity. soak plates in 33 after being heated, then put in 33 Reversed hot for few hours, then charged in 33 then 33% poured out + a percent of KOH put in that after soaking a few hours will be 21% ——— The new molasses mix being used the iron also must have larger pores + prevented from condensing to crystals by the mercury by use of B. Cu Etc this will give economy as the loss of KOH in the pores is the cause of low economy on charge.

15 In connection with this theory is that results just obtained shows that the best output is obtained by charging 15 hours 100 rate 175 amp hr in 33%

+ then putting 21% in place in small Cell & reducing rate 15 hours 200 rate + drawing 100. The result of group which the Required was 4172-3-4-5-46

631 to Vacl	when solution comes 40%
685	626
758	891
700	285	4182-3-4-5-46
740	440
	608

The difference is due with 40% to the Cracking of many of the H_2O_2 particles then releasing them from pressure + putting the out of Contact. The mix is Reg mix. Its the same way on reversing in 33% ~~reaction~~ alg in 21% there are great variations in output + in addition to Cracking there must be other reasons

4167-8-9-10-11-12 40% Reversed -

250
248
226
100
250 -

tr V. It is difficult to account for the "100" on cracking alone possibly Alumina plays some part.

Theory No 2 to account for another reason for gradual loss of capacity

On account of burrs the mix cannot even up from the Edge - also a layer after running adheres to the face of both pocket sides + the center becomes mushy. hence large portion gets out contact, also Nitt particles split + a large number get out contact,

Notice Reversed perfin Cups

4060 -	average Centre swell	15.4	Edge 5.0
4157 33/Hot -	" "	11.0	1.0
2733 old book	" "	9.16	4.93

Both 4060 of which there are 5 pockets
" 2733 " " 3 "
Shows high runs 530 to 560 and they keep Constant after many runs -
4157 is bad for other reasons being run reversed on 33% hot
Evidently smooth inside is very desirable
The swell is abnormally small.

Notice 5 Rpt to groups 1 in 1/2 Nitt dyed-dirty

1 in	2.6	1 in	4.6	1 in	8/-	1 in	16½	1 in	33·/·
	To V								
1/-	113.4								
2	274.2		160						
4	379.4		105.2						
8	448.6		69.2						
16	490		41.4						
33	463 -		— 27						

Then run in 21½ 2 Plus -			
In 1½ -	504.4		on these are groups of .5 or 1 m very regular
2	496.7		
4	504.2		The results on 33% are strange -
8	501.6		
16	513.8		
33	492.6	5	

Its possible Chilling is more Constant in 16% or even 12% than in 21% -

4172	631	Charged 33% aqueous Ni Strip 175 Fahr
4173	684	Tumbled 15 h 100 rate. soaked 14 hours
4174	758	21 then chgd 15 h 200 rate directly 100 21%
4175	700	average swell. 9.12
4176	760	

4177	303	Charged 33% Ni beaker 175° Fahr ~~tumbled~~
4178	678	15 h 100 rate. not soaked
4179	238	Chgd 21% 15 h 200 rate directly 100
4180	640	
4181	540	average swell 7

4182	626	Charged 40% Ni beaker 175 Fahr
4183	391	15 h 100 rate not soaked
4184	265	Chgd 21% 15 h 200 rate directly 100
4185	440	
4186	608	average swell 8.5

4167	250	Reversed 40% in Tumbler 175 Fahr
4168	243	15 hours 100 rate put in 21%
4169	226	chgd 15 h 200 rate directly 100
4170	100	
4171	250	average swell 1.2

4187	417	Reversed 33% Tumbler CP in Strip 175 F
4188	333	15 h 100 rate, then 21% 15 h 200 rate
4189	311	directly 100
4190	384	
4191	258	average swell 3.5

In above nothing shown by Callipers to account for great differences

4192	152	Reversed 33% small cell 175° Fahr
4193	335	15 h 100 rate then 21% chg 15
4194	437	h 200 rate directly 100
4195	419	
4196	X	average swell 5

4162	370	Soaked on ___ hours in 33% alt
4163	405	175 Fahr — no current, then put in 21%
4164	132	Chgd 15 h 200 rate directly 100 rate
4165	128	
4166	130	average swell 5.6

Swell in some recovered cups

4060	Centre	15.4	Edge 5.0
4157	"	11	" 1.0
2733		9.6	" 4.93

These runs are all 550 To 550, Keep constant

Reg Ni put in 1 2 4 8 16 4 33% KOH 4 Chargd reversed chgd thereon

1%	2%	4%	8%	16%	33%
5.2	7.2	7.0	9.0	9.6	38.6

All Centre Callipers + averages of 5 each group groups run Even — Notice big swell in 33%

It is possible that when the Mott particles grow charging when they are weakest — Crack up that the pressure is diminished in the Center so that there is no contact although the Caliper indicates a swell of a few thousands, The hard packed Edges may swell & left the face up Consequently the lifting of the Center would move to the Edges & then the gassing loosens mix up

If this is true there should be a re corrugation after Chg & then a rerun & then kept on till Everything is fixed —

Possibly Chg in 33⅓ & then Re Corr the last for in 33⅓ & then 21½ & then recorrugate,

In a group of cells used in Equalizing that there are sometimes great variations in the Capacity - although the Calliper shows even in all & nothing in Calliper indicates anything - Probable causes are —

1 - Mix full of gas
2 Something Comes out of the 2 inner they are raised
3 Portion of the Cake sticks to burrs & separates leaving Central part unchg
4 - Friction of burrs prevent crowing up of
5 Expansion of Edges lifts Center away from mix
6 Possibly the runs in 385 mix (5%) runs unevenly distributed and runs off center runs
7 Uneven filling of pockets
8 Heat expands pocket & separates mix when it does not expand —
9 In running Mott particles split & go into 2 or more pieces then grow and Contract

Nov 22 1904

At last I've got on to reason of slow loss of capacity and bad tapering end to curve. Its due to deposition of Mercury at the Nickel Contacts. Mercury from the mass is slightly Soluable in 21% KOH, and on discharge deposits within the mix also why when charging any HgO in the KOH deposits on Oxides. This explains why of all the substances used as Electrolytes with KOH, only Iodine in form of KI put in KOH permanently hurt the Nickel by diminishing its capacity. HgO is very Soluable in strong KOH in presence of slight amounts of KI it forms a double Salt, The KI took oxide of Hg from the iron + it was deposited in the Nickel. It only did quickly what the slight Solubility of HgO in KOH does in weeks. I am now trying to dissolve out the HgO from the mix by weak KI in weak KOH. The mass being charged to the limit to throw all the Hg to the metallic state

and thus only the free Hg_2O will dissolve out of now - which is of no value any way as to probable by highly charging the new positive the excess should be taken out by KI any ways. The Ni was also charged now by putting in the KI KOH. all the free oxide will dissolve out or nearly so, then a fresh portion can be put in the cell being warmed & finally thoroughly washed out + weak KOH used twice to remove any traces of KI.

Possibly there are other things than KI that would be cheaper - possibly final washing should be by water, by reducing the free Hg_2O in new drawing + getting out the ingredient which converts the Hg_2O to dissolve in Grease in the KOH, or putting in a substance which will precip the Hg_2O so it cannot dissolve there will be no practical loss of Capacity = Some cells do not loose & this has something to do with either Condition of Hg_2O in the Zn or some ingredient therein which means more or less absolutely of Hg_2O in the KOH -

1 { (Note - Hg_2O dissolved in KOH containing Acetone, or Ketones of higher fatty acids -

2 Dissolves also Carb Ammonia to Hg_2O into Hg_2O which also + Hg -

3 Pyrophosphate Soda dissolves Hg_2O -

4 Warm Hg precipitates of ammonium chloride Hg_2O

5 Cold " K + Na "

No 1 Acetone added to KOH dissolves Hg_2O

(10) Hg oxide prep by KOH, only wants a little Acetone to do it, it works with a weak or strong KOH - Can wash old battery by ~~dissolving~~ Charging Ni + Zn + washing 2 or 3 times etc quick - possibly Can chg Zn + dissolve Hg by K_2O_2 without reducing the Hg_2O -

5 works good, was quick to work in weak or strong KOH Can charge both Zn + Ni + wash it out

Evidently there is a Ketone in our KOH, or something that consumes Hydroxide to dissolve + produce gas, we are trying to find it. also some stable Chemical to put in that will make Hydroxide always available —

Possibly a little Magnesium which would amalgamate Lead + which is slightly Sol in KOH would keep it from Ni-

In the old book where there were many runs on 10% + 20% The average runs on 10% 600 amp hour discharge End of 15 runs was 195 Coherons 20% was 325— at End of 30th runs 10% was 140 average Coherons 20% was 168.3 ——

Notebook, N-04-11-07.2

This notebook was used during November 1904. It contains notes by Edison and an unidentified experimenter regarding storage battery experiments. Included are entries for endurance tests of E-18 type cells arranged in groups, numbered from 24 through 36, with different iron and nickel combinations. An inscription on the inside front cover indicates that groups 1-23 were entered into a "big book." The front and back covers are both marked "Group." The pages are unnumbered. Less than 20 pages have been used.

07-11-07

Groups up To 23
in big book-

Nov 7 1904 GROUP TESTS-

GROUP 24 Bad 2 18-
No 2271 80 95
Ni Mix 7½ Mix -

Charge KOH Reverse Ni to can on
asbestos 120 Tahr 24 hours 80
amp- Charge the KOH again & put
in B greentubes in one can
Potassium Chloride Charge
24 hours at 40 discharge to 7/5
Recharge 12 hours & put on
endurance Test,

Lot #	mi mix # 234 Ex mix # 5000 #2271		% Loss	mi mix 117 #80			% Loss	mi mix 117 #93			% Loss
	To V.	To .75		To V.	To .75			To Volt.	To .75		
original Run 6 R	144			139				139	/		
Run 2 Lab Mfg extract	124	128.	14%	114.5		.70 112	18%	113	114.5		19%

GROUP 25 E18 Bad Cells
Nos 101 102 73

Re mix 117 72 mix
Put cells with fresh KOH, into
water and bring water up to
175° Fahr for 24 hours
Then Charge KOH reagent charge
24 hours at 40, discharg to 1.75
Then Recharge 12 hours at 4.0.
+ put on Endurance Test,

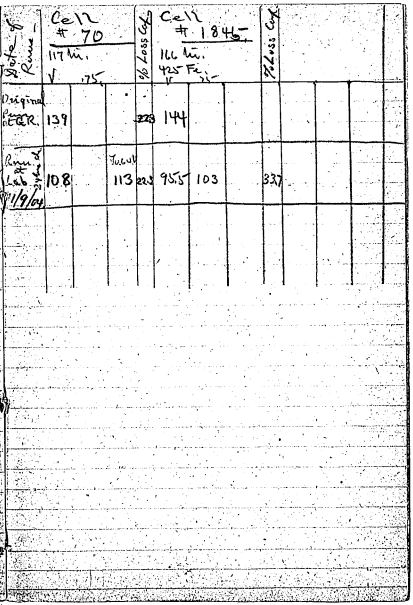
Date & Runs:	Cell #73 From Metzger, U. V	.75	Loss in Cu %	Cell #101 V	.75	Loss in Cu %	Cell #102 V	.75	
Original Run @ R.	144			133			114	.70 V 115	
Run at Lab 11/9/04 24 hr run	110	.70 112½	24%	110	Tr. 67 112.5	17.3%	111	.726 V 113	24%

GROUP 26 E18 Bad Cells -

Nos 1345 70 ~~102~~

Ni Mix. Fe mix

Charge KOH Reverse Ni to Can
~~125~~ 150 Faber Castell, 30 amps
48 hours, Charge KOH again -
Charge 24 hours at 40,
discharge to ~~75~~ 50, recharge 12
hours at 50, + put on Endurance
test.


Cell # 70
117 Mi.
175'
% Loss Cyl
Cell # 184
166 Mi.
425 Ft
Psi Loss Cyl
Original
Leak Rate
139
223
144
Leak Rate
11/9/04
108
113
22.8
95.5
103
337

Group 27.

Nos 5621 5234 5283

No mx 7z mx
3 E18 Made up from bad
Gibbs truck cells, not
washed put KOH 21% in
Charge 24 hours Then discharge
to 1.75. When Cut down to
2 and then pack in cells Charge
& Reverse Readings to Com
100 hours at 20 amperes
dont let temp go above
125 F after anywhere Between
110 & 125 will do Keep
record of temp, after 100
hours Shake Call & pour
out KOH put in a fresh
Solution 1/2 full & shake
jar to wash out can &
drain it again then
put in Reg Amount of
21% Charge 24 hours
discharge to 1.75 - Rich 12
hours & put on Endurance
Over

The final KOH used was to be put in after the 100 Run. so far one Cell KOH ~~[illegible]~~ treated with Mellow before it goes in Cell no. The 2nd Cell the KOH as we got it dissolved + kept from Carbonate as far as possible + allowed Settle + the 3rd Cell 3rd Cell Reg KOH and we use it now,

11/9/04

Cells were made from Libbs E.45 #444 & 504

#444 made from #232 Ni + #500 Fe.

#504 " " 230 " + 490 Fe.

Original of E.45 #444 = 390 A.H. 5 V. Point 337 A.H.

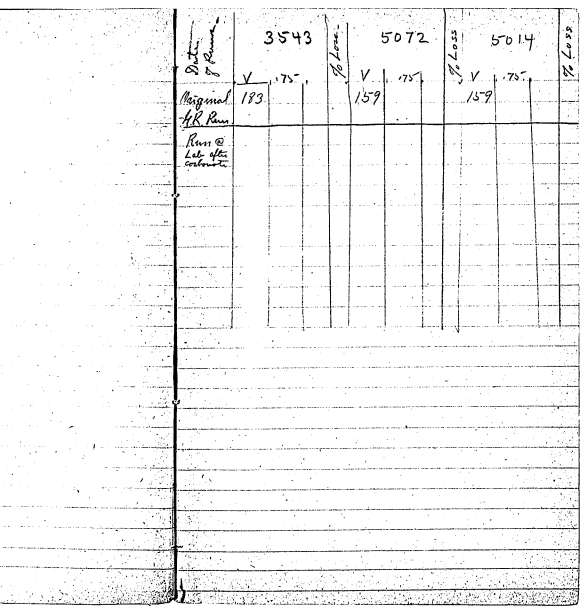
" " " 504 = 397½ " " " " 287 " "

Group 28 Reg 218

No 3543	5072	5014
Ac 287 Fe 625	Ac 388 Fe 597	Ac 388 Fe 597
No mix	7% Mix	

This group of cells have KOH containing 15 per cent of KOH + 5 per cent of K_2CO_3 — to inhibit Reg cells which have become Carbonated so there is only 15% KOH plus the balance have now Carbonated —

Charge 24 hours discharge to 7½. Recharg 12 hours Reg amps + put on Experimental +


Date Test Run
3543
% Loss
5072
% Loss
5014
% Loss
V
.75"
V
.75"
V
.75"
Original
183
159
159
4R Run
Run @ Lat. 4R setback

GROUP 29 Reg E18

No ___

Mimx 7x mix -

These cells charged 24 hours
discharged to 75# charged
12 hours ~~[illegible]~~
Then the following substances
put in the cell,
a mix/time consisting of
1 gram Each of the following

Ba Sulfate	#3921
Ba Carbonate	4908
Ca Carbonate	4714
Mg Oxide	4647
Mg Carbonate	4496

Aluminum Metal dissolved to 4824
make 1 gram of Nitrate
put these in small graduate
KOH, pour in ~~[illegible]~~ like
Cell & put on endurance

GROUP 30 E18 Reg

No 5566 5457 5282

No myg 37 72 mi 603

These cells are to have dry plates never washed
Then put in 21% KOH
Made Apparently by GWA
from 3.6 gms of pellets
Then charge 24 hours
Reg discharge to .75.
Charge 12 + put on
Endurance.

GROUP 31 - 9bbs

Duplicate of Group 10
with another Nickel mix

No. 5324	5406	#603
Ni mix	Fe Mix -	
6 plates #212 Ti.	3 plates # 421 Fe -	
6 " #232.	3 " # 550 ".	

GROUP 32 9:66s

No Ni mix — Fe mix —

Reverse Nickels against can at about 125° Fahr 48 hours, change KOH, by pouring out 1/2 & shaking the baskets to clean out Calf put in fresh KOH, add to NO A — cells 6 grams Potassium Chloride to 70°

18 grams Potassium Chloride at 70° — 36 grams Potassium Chloride

GROUP 32 E18-

New cells with Cups reversed perforations burrs outside, both Cups Wash Irregular,

100 5203 5272 5632

Na mix 378 Fe mix 609.

These cells are to be charged 24 hours discharged to .75 then Chg 12 hours & put on endurance test.

GROUP 33 E 18

Cells No 5291 5347 5662

New cells with perforations reversed the hours being noted & batt made & outside case & each put in 33⅓ KOH ~~Reverse~~ Reverse Nickel to Can 125° Fahr 24 hours 30 amperes ~~Discharge~~ Charge KOH to charge 24 hours discharge to 1.75. Then Chg 12 hours & put on Endurance 378 Mi — 609 Fe.

New cells ~~unmarked~~ unmarked Neg. - Reversed perforations Put in 33⅓ KOH. Soak for 5 hours, then pour it out + added fresh 33⅓ KOH, then Reverse Nickel against Can 24 hours heat 125 to 130 Fahr, then pour out the 33⅓ - put in Water soak 5 hours pour then out + put Neg 21% filling & test gravity, make it little less than 21% Then Chg 24 hours discharge to 1.75. Then chg 12 hours & put on Endurance,

GROUP 34 Bat 9166

Nos 5717 5549 5250

Minmax 212 Temix - 481

These 3 cells to have 33% KOH in + Nickel reversed against Can 24 hours at 125 to 130° Fahr - 30 amperes, Then pour off 33% ~~KOH~~ ~~Soak~~ ~~Temp~~ ~~6 hours~~ ~~Pour out~~ + put in water + soak for 6 hours, pour out water + add, 25% KOH Soak 6 hours + determine the gravity so that we are sure it dont exceed 21%. preferably 18 to 19% — Charge 24 hours discharg to 7%. Reading 12 hours + put on Endurance -

GROUP 35 Bad Cell

Pour out KOH, then put in 33% and permit it to stand 3 days. Then pour out 33% and put in 18% KOH + teal graphite to get 21%
Charge 24 hours + during to .75 If Cell comes up good charge 12 hours + put on endurance if not I hold it for further Experiment

GROUP 36 - E18 new

Req wash and proper KOH put in to make 10% Solution,

No 2964	4813	5011
M mix	7x mix	

Charge 24 hours [redacted] discharge to .75. Then chg 12 hours & put on Endurance test,

Notebook, N-04-12-12.3

This notebook was used during December 1904 and May-June 1905. Most of the book contains notes by Edison and an unidentified experimenter regarding storage batteries. The experiments are numbered from 1 through 645. Among the entries are items pertaining to the loss of capacity, including an examination of the presence of mercury in the electrolytic solution. Other entries relate to the rejuvenation of the nickel electrode. At the end of the book is a phonograph drawing from June 1905. The pages are unnumbered. Approximately 140 pages have been used.

X-E-172 N-04-12-12

Dec 12.

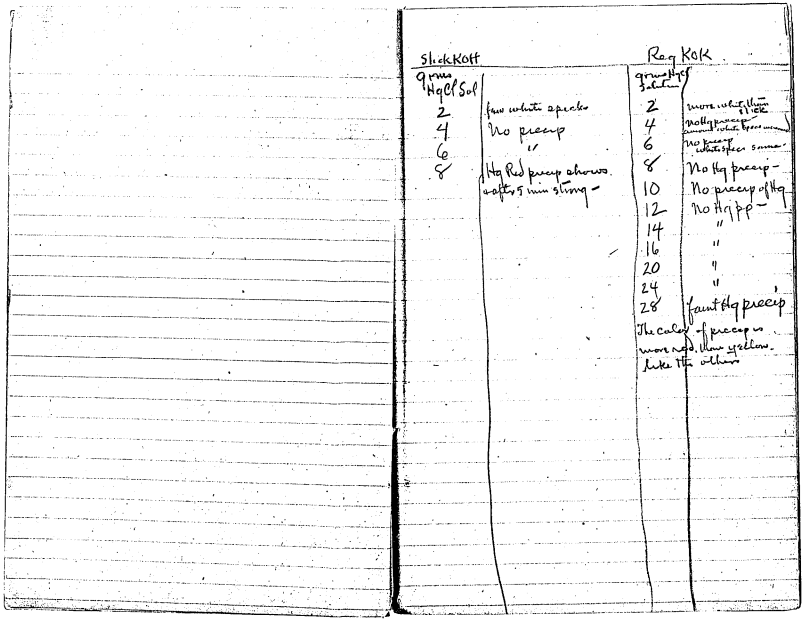
Experiments on dissolving Mercury in KOH in presence of various things, a try to ascertain what capacity of battery gravimetrically depends.

Two test tubes 10 cc of Reg 21% KOH, treated Ba

The other tube 21% stick KOH 6g alcohol.
2 cc of solution (1000 cc 1000 Milligm $HgCl_2$) put in each tube —

in Stick KOH, no precip except fews floats of colorless, 2

in Reg KOH, no Hg precip but more flecks of white precip.



Slick Koff

9 mins Hg of Sol	
2	faint white ppt
4	No precip
6	"
8	Hg Red precip shows after 5 min strong -

Reg KOK

grains Hg of Sol	
2	more white than KOK
4	really precip white from start
6	no trace of white ppt some -
8	No Hg precip -
10	No precip of Hg
12	No Hg pp -
14	"
16	"
20	"
24	"
28	faint Hg precip

The color of precip is more red than yellow like the others

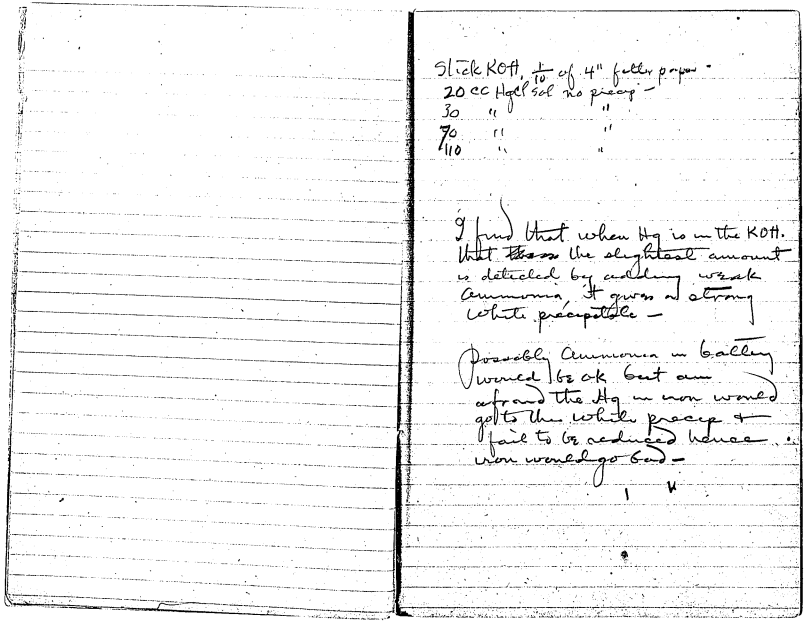
Lump Kott, not filtered or Barium nit

2 qc	No Hg precip
4 qc	"
6	"
8	faint Hg precip — not 1/2 that of Stick Kott-qc 5 min
	Evidently Crude is nearly as good as Stick

Slick KOH, treated with BaOH.

25 cc HydrSol no precip -
35 cc "
55 cc "
75 " "
95 " "

Silicic KOH -
Treated with Lime
10 - no precip
20 "
30 "
40 "
60 "
80 "



Slick KOH, $\frac{1}{10}$ of 4" filter paper.
20 cc Hg(ClO$_4$)$_2$ sol No precip —
30 " " "
70 " " "
110 " " "

I found that when Hg is in the KOH. that there the slightest amount is detected by adding weak ammonia, it gives a strong white precipitate —

Possibly Ammonia is lacking ~~wanted~~ weak but am afraid the Hg in urine would go to the white precip & fail to be reduced hence ... urine would go bad —

I V

I found that Mecurous chloride - the slightest amount is precipitated with Stick KOH, showing that it is the Mecuric Oxide that is Soluable -

If 100 cc Reg KOH, has poured into it 5 cc of (5 grm 1000) $HgCl_2$ Solution get good precip at once - but if the 100 cc of KOH is diluted 5 times, + the same amount of $HgCl_2$ solution put in there is no precipitate, on adding another 5 cc of the 5 unit solution get precip -

Hence it will be dangerous to dimmish the % of KOH in battery if Hg is there in a Mecuric State,

With 100 cc Reg KOH 1 cc of 5 unit $HgCl_2$ Solution gives no visible precip but 2 cc shows slightly - Therefore the Solubility

increases as the Concentration of the KOH decreases —

Iodide of Sodium does not dissolve the precip of mercuric ~~Amidos~~ by NH_4 in KOH. It turns it yellowish

If INa Gs added to KOH containing dissolved HgO + then NH_4I added the precip is Red + fluorescent like Fetric -

NaI dissolves HgO an alkali OR -

I think that when NaI is dis in HgO KOH, that the red pp on adding NH_4I is HgI

NaI does not appear to dissolve Hg_2O appreciably yet does it leaves a dirty colored pp behind but I think it does dissolve - there is some

Mercuric in the Hg_2O as the ~~[illegible]~~ as add'n NH_4Cl turns it slightly red-dish but not much —

Reg KOH, NaI & NH_4Cl give no sign of coloration, add'n some Al KOH, no sign —

pp of Mercurous in KOH, is partly dissolved by Thiosulphate, leaving a whitish pp of ½ or less quantity What is this, possibly the white part of the Red Crystal in gelbs pockets —

Reg dissolves very much more Mercurous Ox than this, if precip light seem dissolve it all in excess of Reg

Precip of HgO in NH4 is dissolved by Thiosulphate. its also dissolved by KCy but not by Iodide Na this is a distinction, as Iodide dissolves bat + Thio + Kcy do not - why? —

Iodide Na gives no ppt in presence of Either Thio or KCy in HgKOH NH4 Solution —

perhaps the white part of the precip of HgO is HgCl as I think that is insol —

I made some HgCl - put it in KOH, Thio dont dissolve it, Iodide Na dont dissolve it, KCy dont dissolve it But I notice that the white ppt by adding Hg No3 to NOH - nearly all dissolves when pounded in KOH slightly but there is some ppt not

dis is this, HgCl or what,

HgCl apparently most weak KOH, but is not strong KOH, Therefore the Red Crystals or globs may be a combin of HgCl + H_2O, + if I use strong KOH this and This the whole may dis or KCy soluble

In all cases working with Mercurous, there is a very slight cobalt ppt. left. That may be some reg. chromium in the KOH, which is rendered insol by H_2O Reagent,

1 wet
13 25
1 Dry 88 83

3 wet 100 114
3 Dry 120 125 130 133

4 wet 93 115
4 Dry 132 148 160 167 183 192 213 212 218 205

6 wet 117 145 165 161
6 Dry 142 157 162 165 183 190 200 226

12 wet 85 110
12 Dry 142 167 180 192 213 223 244 245 244 258

May 17 1905 –

Experts on Rejuvenating Nickel Electrode of Cells which have gone down to 100 m a h per pocket in Capacity. (218 = 31.1%)

Soaked in following Solutions with idea that films in some Chem Je Hg- Graphite or other Carbon acid or Compounds on Contrads,

1 = Strong ~~Solution~~ $NiCl_2$

2 " " $NiCl_2$ with Methyl in alcohol

3 Nitrate $Ni + H_2O_2$

4 Oxalate Potash, $+H_2O_2$

5 Na Chloride $+H_2O_2$

6 "Mercuric Cyanide"

6½ " $+H_2O_2$

7 wet 122 133
7 dry 148 165 171 177-192-197 200-200-218
5 wet 20 25
5 dry 114 120

10-1st Wet
100-127
10 ☆ x x 140 153.173-187 188

12 wet
SC 85

13 wet
97 92

14 wet
106 126
140 x x 126 133.142

10 wet 142 182 199 204.225-229 252-253-260-263 287
15 ☆ x x 158 156 166.190-252-253.197 199 213 220
16 wet 42, 97
16 ☆ x x 180 195-210.220.227-226-240

17 ☆ x x x 115 133
17 wet 133 158 172 171.183-185 195-195-
14 ☆ 153 177-183 185-198.202-214 -208-215-223
15 wet 83 93
16 wet
43 77

7. Stang H_2O_2 – ideal 20% of Reqm H_2O –
8. Sulphate ammonia
9. Chloride ammonia –
10. Stang NaOH – ammonia –
11. ~~Sulphate NH3 + H2O2~~
12. Chl Na + H_2O_2
13. Stang $MnCl_2$ ~~+ H2O2~~ + H_2O_2
14. " " with alcohol ~~+ H2O2~~
15. K Ferrocyanide ~~+ H2O2~~
16. K " ~~+ H2O2~~ H_2O_2
17. Ferricyanide –
18. " + ~~H2O2~~ H_2O_2
19. Hyposulphite Soda
20. Oxalate Ammonia

22 wet
100 122
223 x x 139 153 -180 Red bottom

All the bad ones are those in which the Aluminum dissolves the Nickel Hydrox
25 D 140 174-195 208-217
25 W 190 -200 -205

27 wet
50 75

29-W 142 -162-174 184-192-212 217-223
29 D x x 171 177-192-204-212-211

30 wet
10 28

31 wet
46 73

33 wet
42 47

34 wet
15 23

21 Oxalate ammonia + H_2O_2

22 Acetate Potash + H_2O_2

23 " + KOH,

24 Borax

25 " + H_2O_2

26 ~~Alum~~ Potassium Sulphate + H_2O_2

27 Carbonate Soda

28 " + H_2O_2

29 Bicarbonate Soda + H_2O_2

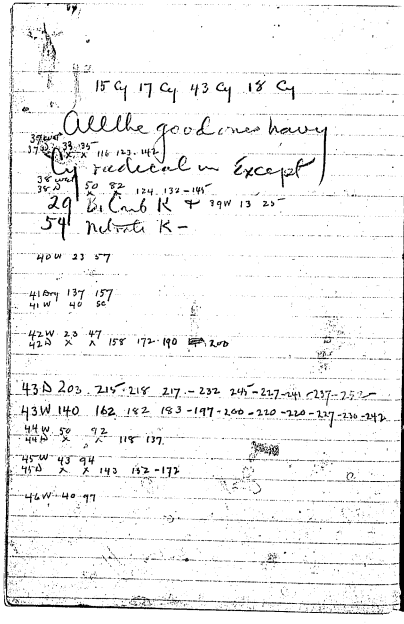
30 Chloride ammonia + H_2O_2

31 Acetate Nickel Salammoniac + Acetate + H_2O_2

~~32 Sulphate Nickel + H_2O_2~~

33 Sulphate Nickel

34 " + H_2O_2



15 Cy 17 Cy 43 Cy 18 Cy

All the good ones heavy Cy radical in Except

37 W 38 135 116 132 142
37 D X X
38 S 39 50 82
39 D X 124 132 145
29 Bi Carb K + 39W 13 25
54 Nitrate K –

40W 23 57

41 Bay 137 157
41 W 40 56

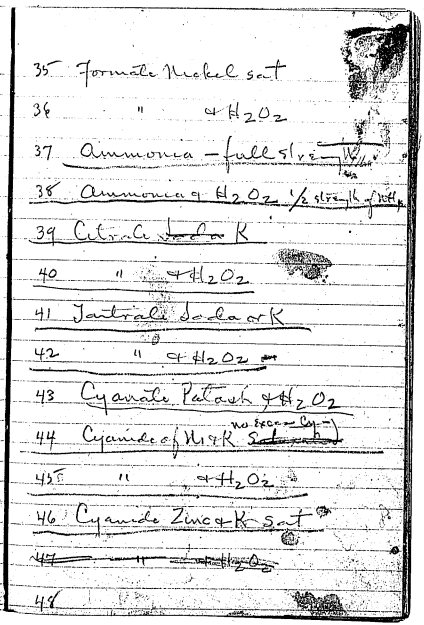
42 W 23 47
42 D X X 158 172 190 200

43 D 203 215 218 217 232 245 227 241 237 252
43 W 140 162 182 183 197 200 220 220 237 230 242

44 W 58 72
44 D X X 115 137

45 W 43 94
45 D X X 143 152 172

46 W 40 97



35 Formate Nickel salt
36 " + H_2O_2
37 Ammonia – full strength
38 Ammonia + H_2O_2 ½ strength of both
39 Citrate Iodine K
40 " + H_2O_2
41 Tartrate Iodine K
42 " + H_2O_2
43 Cyanide Potash + H_2O_2
44 Cyanide of Ni & K no Ferro or Cy –
45 " + H_2O_2
46 Cyanide Zinc & K salt
47 " + H_2O_2
48

49W 10 38

50W 60 92

51W 94 117 153 170-193
51D K

52 wet 40 69
52 dry 115 112

53W 113 140-157 162-185-157 213-209-215-223
53D 150 152-

54-W 147 172-187 192 211 219 233-192
54 D 143 143 15 -235-232

56W 20 95
56D 152 159

57W 87 95

58W 75 105
58D 123 124

59W 89 117
59D 122 121

Count 2. 8

61D 30 59

62W 99 117
62D 140 143

49- Oxalate K -

50 Nitrate Ammonium + H_2O_2

51 Potash Nitrite + H_2O_2 slowly

52 Sulphate Ammonium + H_2O_2

53 Nitrate K + H_2O_2

54 " only

55 NH4Cl free NH4 + hot 21% KOH, H_2O_2

56 HCl - 21% KOH + H_2O_2

57 Mn + NH4Cl Double salt + H_2O_2

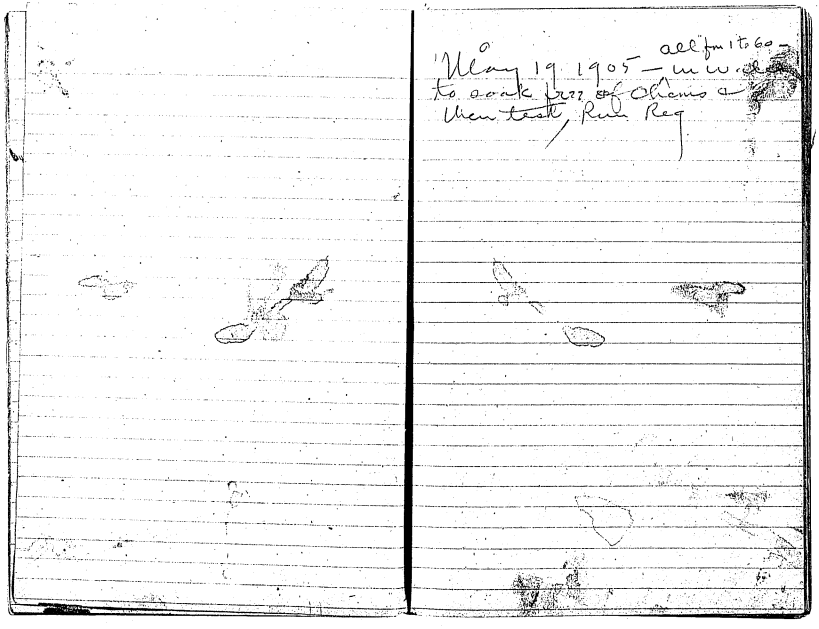
58 - alcohol. Ethylic - H_2O_2

59 - Benzol - + H_2O_2

60 Chloroform - + H_2O_2

61 Pyridin -

62 - Acetone



63 mg
64 D 114 148

65 W 18 52
65 D 138 150
66 D 155 167

67 D 100 100
67 W W 100 100
68 W 47 70
68 D 33 43
68 D 15 33

69 D 15 33

70 D 50 115

71 mg

72 mg

73 D 125-131
73 W 110 115

63 - phloroglucol Tri (Reagent)
64 Lithia ROH & Pyrogallic A -
65 = Sulphite Soda
66 Ferrous Sulphate
67 Aldehyde -
68 ½ Magnesia - Chloride & H_2O_2
69 " " only
70 Iodide Potassium
71 Ferric Chloride -
72 Carbolic A in H_2O + H_2O_2
73 Amylic Alcohol - H_2O_2
74 Aniline
75 Chloral Hydrate -

76 mg 76D - 78 - 100

77-D 138
77

both Rotten, To Eaten away

79 mg 77DD 14.5

80W - 15 - 16
80D 31 29

83W 0
83D 15

87 W 43
87 D 40

76 Aniline

77 Ell

78 Ferric Chl in Ethyl Al

79 Ferrous Chl in 50% Ethyl

80 " "

81 Chlorate K + Prussian H_2O_2 + H_2O_2

82 " + H_2O_2

83 Permanganate K + Prussian H_2O_2

84 Saturgled Cyanate K

85 Dilute "

86 Weak KCy

87 Sulphocyanate K + Prussian H_2O_2 also + Prussian H_2O_2 alone

88 KCy + CaCy

89 Dry 243 – 250, 287 – 295 – 317 – 323 328
89 wet 283 267 – 300 – 312 – 311
90 D 158 – 162 195 192 200 – 208
90 W 97 –

93 wsc
93 D 145

94 W 87
94 D 114

95 W 92
95 D 117

96 W 47 Cupe family bright –

98 W 62
98 D 210 – 237 – 240 – 256 – 260 – 267 – 274 – 281 – 300 – 344 348
310 342

99 W 13
99 D sight

0 109 wet 24

89 Arsenate K – Prew H_2O_2 all H_2O_2 (Tube washed other 21% Hot + recorded again)

90 Bisulphide Carbon

91 Benzoate K

92 Salicylate K or Na

93 Metaborate K (Prompt H_2O_2 Warm or Na Hhhh)

94 Chromate K or Na

95 Tungstate K or Na Prewarm H_2O_2 warm

96 Barium Chloride Prewarm H_2O_2 Warm

97 Bromide K Strong Prew H_2O_2 H_2O_2

98 Cadmium Iodide Prew H_2O_2

99 Ammonia Hydrosulphide Warm

100 Sulphide K – Liver Sulphur Prey H_2O_2

101 W 42
101 D 130-162 143-174-184

102 W 23
102 D 53

103 W 21
103 D 132

104 W 100
104 D 175-185-190-190

107 W 7
107 D 90

110 W 100
110 D 162

111 D 143-157-

111 W 90-97

112 D 100

101 Cadmium Chloride Prev H_2O_2 – very little ppt

102 Calcium Chloride * Previous H_2O_2 – very strong

103 Zinc Chloride Prev H_2O_2 – super bright

104 Pot perchlorate K Prev H_2O_2 ppt

107 Calcium Chloride

106 Copper Ammonium Sulfate

107 K Fluoride Prev H_2O_2 H_2O_2

108 Mercuric Chloride H_2O H_2O_2 Prev

109 " " water – Prev H_2O_2

110 Iso Cetyl Benzene – Small ppt H_2O_2 & by Dilute to best minimum quantity – or Ethyl Lake –

111 Nitrobenzol not H_2O_2 –

112 Dinitrobenzol in alcoholic Prev ppt

113 Insoluble in K

114W 16

Somewhat brighter —

119W 100

120 wet 45

120 [illegible] 145 167

121 D 63 98

121 W 23 47

122 W 77

114 Iodaform m. Solvent, Prev H_2O_2 wet

115 KCy + HgCy

116 (CaCy KCy dil of 88)

117 CoCy KCy

118 Cyanurate K

119 Urea. Prev H_2O_2 + H_2O_2

120 Turpentine,

121 Terpineol. Org Cup —

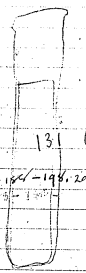
122 Hydroquinone. Prev H_2O_2 —

123 Formaldehyde —

124 Nitroprusside Kor Na

125 Tetrachlorbenzol in Tabs.

126 Cyanate Ka Lugol — 10 mm —



130 W 76

131 W 118
131 D 140

131 Cupr. Acet.

132 W 150, 163, 186 – 198, 200 – 217 – 232
132 D 165 – 195 – 198

135 W 129
135 D 119 – 110

136 W 112
136 D 80

138 W 0² – 173 – 163 – 163
138 D

139 W 88
139 D 119

127 K a glucose –

128 Alcoholic KOH

129 " NH4 –

130 Camphor in Alcohol, Dry –

131 Pretty Conc $KNO_3 + H_2O_2$ Kept warm

132 B. Carb Conc Nac H_2O_2 Kept warm Prussn H_2O_2 odour

133 Strong Sugar + K Cyanate Warm

134 Strong Sugar + Ferrocy, Warm –

135 Conc K Cyanate, H_2O_2 & previous H_2O_2 Warm

136 Conc Ferrocy K no H_2O_2 beat prussn H_2O_2 Warm

137 Hg Cy Conc H_2O_2 Conc Prussn H_2O_2 Warm

138 Carb Soda Conc H_2O_2 & Prussn H_2O_2 Warm

139 Mercury Cy Conc Prus H_2O_2 Warm

140

142 D 130

1

143 W 53
143 D 143

144 W 86
144 D 157

145 W 46
145 D 133

146 W 112
146 D 152

147 W 52

148 W 71
148 D 143

149 W 7

141 – K Peroxmate – Prox H_2O_2 + H_2O_2

142 Tetraethylmethylene amine Prox H_2O_2 Dry

1

143 Trimethyloxymethylen amine Prox H_2O_2 Dry

144 Hexamethylenamine Prox H_2O_2 Dry

145 Trioxyethylene-amine Prox H_2O_2 Dry

146 Cyandiamine Prox H_2O_2 Dry

147 Tint. triaethyl hydroxyd Prox H_2O_2 Dry

148 Tetraethylamine Hydrox Prox H_2O_2 Dry

149 Triaethylsulfin – Prox H_2O_2 Dry

150 W 92

149 D 54

152 W 61
152 D 161

153 W 75
153 D 152

154 W 92
154 D 170

155 W 90
155 D 150

156 W 65
156 D 145

150 KChlorate. Prew H_2O_2 H_2O_2 Dry

151 - Make a Reg run in cell with 3 grams perchlorate Potassium.

152 Diazthylamine 10% Prew H_2O_2 Dry

153 Ethylenediamine Prew H_2O_2 Dry

154 Triethylenetriamine Prew H_2O_2 Dry

155 Propylamine Prew H_2O_2 Dry

156 Benzylamine - Prew H_2O_2 Dry

157W 7½

158W 102

159W 67

160W 53

161W 83

161D 47

Opts grew—think Ni has dissolved

162W 55

163W 61

164D 117

157 Conc ferrocyK + 21% KOH Prew H_2O_2

158 Conc ferrocyK + 10% KOH Prew H_2O_2

159 Conc ferrocyK + 5% KOH Prew H_2O_2

160 " 1% KOH Prew H_2O_2

161 Conc ferrocyK + Nitty full strength, Prew H_2O_2

162 Strong ferricy + 21%. Prew H_2O_2

163 " 5% "

164 " 1% "

165 - full strength H_2O_2 in tube. Worn in glucose with 5% KOH

166 W 112-
166 D 145-
164 W 80

167 bright Exact deep red spots
167 D 162 182
167 W 120

169 D 175
169 D 182 190
169 - Developed bright grey
Built up face -
Foamy SO

170 no bright but pleasing when developed
dark does not affect -
170 D 163 190 - 203 - 215 - 235 - 241 249 -
170 W 86

171 W 86
171 D 177 169 - 193 - 217

166 - KCyanate, 21% KOH Prev H_2O_2

167 " 1% " "

168 Bi Carb KCyanide Prev H_2O_2 + KOH 5% -

169 - KOH, 1% Glucose 20% Prev H_2O_2 Hot

170 KOH 5 " 20% "

171 KOH 20 " 20% "

172 Strong Ferrocy K + Glucose, Prev H_2O_2 Hot

173. " " + 1% KOH, Prev H_2O_2

1730 57

Took out after 2 hours, ppt was green - washed & put in H_2O Carbon Some NH_4 =

175 W 110

Took out after 8 hours, ppt was green - Squatted out —

176 - B. 196, 222 - 228, -232-253
176 W 100, 130 140

150 W 118-143 192

173 Conc K Nitrate, 1/4" glucose Prew H_2O_2

174 Conc K Nitrate, 21% KOH, Prew H_2O_2

175 Conc K Nitrate, Farocy 1/4" - Prew H_2O_2
after 8 hours, Squatted out - was ppt in 21% KOH

176 Barium Cyanate, Prew H_2O_2

177 Conc K Nitrate 1/4" glucose, 1/2" Ammonia Prew H_2O_2

178 inch glucose, inch Ammonia Prew H_2O_2

179 inch glucose, 5% KOH, inch Ammonia Prew H_2O_2

180 Barium Nickel Cy 1/4" Prew H_2O_2

181 D 167 193 -215 -202
181 W 69

182 D 40
182 W 7-

183 W 47
183 D 67

184 D 122 167
184 W 43

185 D - 209 - 223 - 253 - 267 - 277 - 282 291 - 312 = 323 - 337
185 W 67

186 W 119 147
186 D 167 193 206, 225

187 W 135 162
187 pretty bright D 148 205

188 D 153 178 - 200

188 Bright
Recommended initial fog and bright
backs front white flare & dirty grease
are bright & make a bright metallic
grey end front

181 Cupro Cupric Cy sat in KCy - Prev H_2O_2

182 - Almost hot in KCy weak Prev H_2O_2

183 Cadm Cy in KCy - Prev H_2O_2

184 Lead Cy in KCy Prev H_2O_2

185 Poloaro Cupric Cy white grey bot Prev H_2O_2

186 - 1" Sulphite K 5% KOH, Prev H_2O_2

187 - 1" Carb Soda 1/4" glucose Prev H_2O_2

188 3/4" Carb Soda 1/4" Ferracy 1/4 glucose Prev H_2O_2

Note glucose in KOH from 1% KOH to 21% - brighten the pockets 1% KOH with considerable glucose not all night Brightens the coat, it's not a shiny bright like acid by a grey bright on the side where the Ni faces the iron, the opp side is acid bright, Evidently glucose reduces the Ferric & dissolves it the solution gets inky black—

A salt with $Ni(OH)_2$ also blackens — dilute dried Ferric hydrate Can't say sure but think the blackening with $Ni(OH)_2$ is due to iron in the Nickel hydrox this I will ascertain If this works ok it would be possible to clean Ni but changing the iron as the salt itself have no action on metallic

now of this manner of
unsealing cell would be
obviated, it would be
necessary to warm it
Change the washing
Sol of 1% KOH, many times
over this would permit
to Elements the -Co dose
otherwise it joined
under the now Soluable
form the nickel ligniche
probably Mercury may
be caused as well as now
forming the nickel,
then the Solution would
not remain bright but
redden it to nickelic
only a double Cy of Ni +
unbeliever say K, would
take out the Co

9 notice the Solution alone
blackens by heat but
not so rapidly as it does
in presence of Ni + Co
Hydroxides

189 = Double oxalate Ni + K — Prussian blue dry

190 Double Cobalt K + Nickel, Prussian blue dried

191 3/4" Carb Soda 3/4" Natural Pot glucoses 6 hours 2 changes

192 1" Nitrate K " glucoses 6 hours 2 changes

193 3/4" Carb Soda 1/4" Ferrocyk glucoses 6 hours 2 changes

194 1/4" Silicate Soda, 8 hours glucoses

195 3/4 Phosphate Soda 8 hours glucoses

196 3/4 Phos Soda 1/4 Ferrocyk 8 hours glucoses

197 3/4 Borax 8 hours

190 Sodium Nitrite green, after 1 hour (exposure) turns yellow & shows increasing tendency to acid bright blue grey bright inside by glucoses —

201W 208-241 265-325-303-317-304
201D 216-325-330-342-350 360-Stiff Arsenite
201A 362

Arsenite or arsenate
thank arsenite

204A 63 77

198 3/4 Borax 1/4 "Ferrocyk — glucose 2nd cl

199 3/4 acetate Soda. "

200 3/4 acetate Soda 1/4 Ferrocyk "

201 1/2 Arsenite Soda "

202 1/2 Arsenite KOH Soda 1/4 Ferrocy. 6 hour

203 1/2 Chloride Soda (Salt) 1/4 Ferrocyk - 6 hour glucose

204 1/2 Sulphite KOH Soda 1/4 Ferrocyk 9 hour "

205 3/4 Tungstate Soda 1/4 "Ferrocyk "

206 - Chl Zinc + Na neutral - "

The 6 hour glucose cups was in 3 hours then fresh KOH glucose put in 3 hours longer. Soaked big 6 zinkar in 1½ KOH for 1½ hours then water only 1½ hours — its ppty not pre KOH or glucose,

8 House glucose in longer

Soaked water 2 hours — then fresh H_2O put in NO KOH. Soaked,

210 D - 1888 220

207 ½ Nitrate K - ¼ Ferrocy K put in 2 percent KOH — 8 hour glucose 2 days 1888 V

208 ¾ Carb Soda ¼ Ferrocy K put in 2% Solution KOH, ✓ "

209 ¾ Nitrate K 2% Sol KOH, " ✓

210 ½ Cyanide K 2% KOH, "

211 Bicarb Soda K + Nickel Brass neutral —

212 8 hour glucose only —

213

214

214 D 153. 165
2

217 D 123. 143

215. 5% KOH, 3 grms Gelatin hat ✓ glucose

216 10% KOH + ½" Sulphite Soda ✓ "

217 10% KOH ½" Sulfite Soda 1/4" Ferrocy K ✓ glucose

218 10% KOH, 1/4" Ferrocy K ✓ glucose

219 5% KOH. 1/4" Ferrocy Hypersulphitelfite ✓

220 2% KOH 1/4" Ferrocy K ✓

221. 5% KOH, Albumin 3 grms hat, ✓

222. 5% KOH. 1/4" Hyposulphite Soda ✓

223. 5% KOH, 1/4" Hyposulphite Soda 1/4" Ferrocy K ✓

Blues Sepia Cy Uranium after 2nd washing — not before
dilute next morning after changing H_2O

Bleach water after all night + three same after changing water

230 D 180 — 1893 — 206

224. 3/4" Nitrate Potash. 2 grms Ferrocy K ✓
glucose

225 3/4" Nitrate Potash 4 grms Ferrocy K ✓
Hypersensitized cups —

226 3/4 Nitrate Soda 10 grms Cyanate K ✓

227 3/4" Carb Soda 7.9 grms Cyanate K. ✓
Hypersensitized cups —

228 1/4" Mercuric Cyanide ✓
Hypersensitized Cups

229 1/4 Mercuric Cyanide 1/2 Nitrate Potash glucose ✓

230. 1/4" Mercuric Cyanide 1" Carb soda glucose ✓

231 1/4 Mercuric Cy 5% KOH. glucose

232 1/4 Mercuric Cy 3/2" Carb Soda 5% KOH
(Hypersensitized Cups)

233 D 95 93

234 D 97 124

235 D 110 123

238 D 110. 127

240 D 61. 62

233 1/4 Mecanic Cy 1/4 Ferrocy K

234 1/4 Mecanic Cy 1/4 Ferrocy 5% KOH

235 1/4 Mecanic Cy 1/4 Ferrocy K 1/2" Carb Soda

236 1/2 Tungstate Soda + 5% KOH

237 1/2 Tungstate Soda, 1/2 Carb Soda

238 1/2 Tungstate Soda 1/2 Carb Soda 1/4 Ferrocy K

239 3/4 Nitrate K 1/4 Mecanic Cy

240 3/4 Nitrate K 1/4 Mecanic Cy 1/4 Ferrocy K

241 3/4 Hyposulphite Soda 1/2 Carb Soda

all glycerined cups

242 3/4 Hyposulphite Soda 1/2 Nitrate Soda

243, 3/4 Hyposulphite Soda 1/4 Mecanic Cyanide

244 1/2" Fluoride Potash 5% KOH

245 1/2 Fluoride Pot 1/2" Carb Soda

246 1/2" Fluoride Pot 1/2 Nitrate Pot

247 1/2" Fluoride Pot. 1/4 Ferrocyan K

248 2 grams Cyanide Pot 5% KOH

249 5 grams Cyanide Pot 5% KOH

250 10 grams Cyanide Pot 5% KOH

245 D 163

Washes after all night + 1 change Glue

255 D 163 140.

251 = 5 grams Cyanide K 3/4" Nitrate K 1½ KOH ✓
4 times

252 5 grms Cyanide K 3/4" Carb Soda 5% KOH ✓
(Hyposmeftal Crups)

253 3/4" Nitrate Ammonia 5% KOH ✓
glucose

254 3/4 Nitrate Ammonia 1/2 Carb Soda ✓
(Hyposmeftal Crups)

255 3/4" Nitrate Magnesium ✓
glucose

256 3/4 Nitrate Magnesium 5% KOH ✓
glucose

257 3/4 Nitrate Magnesium 1/4 Ferrocy K ✓
glucose

258 3/4 Nitrate Magnesium 1/4 Mercuric Cyanide ✓
glucose

259 3/4 Nitrate Zinc (Hyposmeftal Crups)

260 D 165

261 D 167

261 D 167

260 3/4 Nitrate Zinc 10% KOH glucose

261 3/4 Nitrate Zinc 1/2 Carb Soda 5% KOH glucose

262 3/4 Nitrate Zinc 1/4 Ferrocy 5% KOH glucose

263 3/4 Alum glucose

264 = All night in Hypo and fill Na KOH. glucose

265 1/2 Fluoride ~~Soda~~ or K in Rubber Cell glucose

266 1/2 Fluoride K or Soda, 5% KOH glucose in Rubber Cell

267 1/2 Fluoride K or Soda 1/4 Ferrocy K glucose in Rubber Cell

all glucose

268 ½ Fluoride Kor Soda ½ Carb Soda in Rubber Cell ✓

269 ½ Fluoride Kor Soda ½ Wolvac Pot in Rubber Cell ✓

270 ½ Fluoride of K 1% KOH and ¼ Meconic Cyanide, Rubber Cell ✓

271 ½ Fluoride K, ½ Carb Soda ¼ Ferrocyan K – Rubber Cell ✓

272 ½ Iodide Potassium ✓

273 ½ Iodide Potassium 5% KOH ✓

274 ½ Iodide Pot ½ Carb Soda ✓

275 ½ Iodide Pot ¼ Ferrocyk ✓

268 DA 143 –
268 D 167–197

270 DA 154
270 D 167

271 DA 147
271 D 182

274 D 150–162 – 163

276 D 155

277 D 154

277 – Bright –

284 AD 163 –
282 D 192 – 198 – 203
283 Bx – light – legend Skylight green tint
283 A – 163
283 D 195
Very bright – yellow at front edge legend clear
not bright and muddy
284 D 203 – 209 – 217
284 DA – 173

276 ½ Iodide Pat. ½ Nitrate Pat ✓

277 ½ Iodide K ½ Nitrate Pat, 5% KOH

278 ½ Iodide Cadmium 5% KOH ✓

279 ½ Iodide Cadmium ½ Nitrate K ✓

280 ½ Iodide Cadmium ½ Carb Soda

281 ½ Iodide Cadmium ¼ Mercury K 5% K 4%

282 Soaked 1 hour Oxalic – Then under hour ~~Sky light~~ KOH 21% warm 1/8 inch –

283 Ditto Phosphorous 1/8 inch

284 Ditto Arsenic 1/8"

Nat Brazil(Com) much
285D 203-208-233
285Da 170

Slight grossness & tunl, not brightened scarcely my

287 [illegible] a very little yellow fluorescent comes out [illegible] 30cy 1 milligramme it turned red after a while —

288 - notice hot white stuff when taken out and - also little orange green shiff — very — [illegible] — turned red in boiling [illegible] the brown — but so pale [illegible] —
4 hours is probably limit in reds —

289D 173 - 194 - 197 - 220

290D 173 - 220 - 230 - 243

291D 133 - 160 - 170 155
291Da 202 - 217 -

292D 220 - 170 - 100, - 317? 318 299 289
292Da - 324 - 299 - 303 -

285 ditto Chromic 1/16 much

286 - ditto Sulphurous 1% -

287 = 2 hours in 2% (about) Hydrafluoric acid, then water (warm) 4 hours, then 2% alk night warm -

288 - All night in same solution as 287 + in Water 2 hours - then KOH 20% hot
Solution very green - ppt dissolved conc. Soda
MJ

289 - 1/2 Arsenate Soda 1/2 Carb Soda

290 1/2 Arsenate K Soda 1/2 Nitrate K Soda

291 1/2 Arsenate K Soda 1/4 Ferrocy K

292 1/2 Arsenate K Soda 1/4 Mercuric Cyanide

Acid Bright's exact from agar pl.
293D 13 – 248 – 265
293A 160 – 222 – 230

294D 152 – 143
294A 157 – 177

295D 152 – 200 – 233
295A 157 – 208 – 217 – 251

296D 144 – 172
296A 133

297D 206 – 262 – 260 – 250
" A 242 – 275 – 295 – 312 – 298 298

299D 117
299A 145 – 157

293 1/2 arsenite K Soda 1 1/2 % KOH

294 1/2 Arsenite Soda 2 1/2 % KOH

295 1/2 Arsenite Soda 1/2 Neutral K – 5% KOH

296 1/2 Arsenite Soda 1/2 Carb Soda 5% KOH

297 1/2 Arsenite Soda
afterwards put in water at 65° 24 hours put in heat 21% for several hours,

298 1/4 Benzoate Soda or K

299 1/2 Orthophosphate K or Soda

301 D 100 – 141 – 193
301 A 100 – 127

302 D 104 – 117 –
302 A 146 – 148

304 D 152 – 48 – 213
304 A 143 – 165

305 D 50 – 0
305 A 80

306 D 50 – 0
306 A 91
~~Ammon~~ 116

307 D 90 – 121
307 A 116 – 171

308 D 104 – 139
308 A 160 – 183

300 1/2 Metaphosphate Soda ✓

301 1/3 Pyrophosphate K & Soda ✓

302 1/4 Bichromate K – ✓

303 1/4 Picate Soda or K. ✓

304 1/4 Iodide Potash 5% KOH ✓

305 1/2 Nitrate Lead ✓

306 1/2 Nitrate Lead 1/2 Nitrate K ✓

307 3/4 Nitrate Magnesium ✓

308 1/2 Nitrate Magnesium 1/2 Nitrate K ✓

309 D 113 – 148
309 A 100 – 115

310 A 145 – 157

311 D 97 – 142
311 A 85 – 117

312 D 0 – 85
312 a 7 – 104

313 D 47 – 126
313 A 74 – 122

314 D 100 – 107

316 D 157 – 169
316 a 143 – 157

317 D 89 – 103
317 a 95 – 100

309 ½ Nitrate Magnesium ½ Ferrocyk ✓

310 ½ Nitrate Magnesium ½ Carb Soda ✓

311 ½ Nitrate Magnesia 10 grms Cyanate K ✓

312 ½ Nitrate Magnesium ¼ arsenate K ✓

313 ½ Nitrate Zinc ✓

314 ½ Nitrate Manganeeeee ✓

315 ¼ Nitrate Bismuth ✓

316 ¼ Nitrate Bismuth ½ Carb Soda ✓

317 ½ Nitrate Manganeese ½ Carb Soda ✓

319 A 317

Special Test

318 1/2 Ferrocy K – ~~the~~ on hot plate
12 hours, Heat Hot water every 4 hours for 24 hours
Then – 21% KOH, Heat for 10 hours
Wash with water twice, 3 hours apart – on heater

319 Arsenate Soda "

320 1" Bicarbonate Soda "

321 1/2 Binoxalate K or Soda "

322 1/2 Bichromate Pot

323 3/4 Phosphate Soda or K

324 1/2 Biborate Soda

325 1/4 Mercuric Cyanide

326 15 grams Cyanate K

Boiled 1½ hours then
Cooled in water —

326- Arsenite ~~soda~~ saturated
Solution ~~[illegible]~~ boiling on
Sand Bath put in 6 pockets
Keep them nearly Boiling
adding water to keep
by Evaporation, do this for
4 hours then put add in
water & boil until test
show no phosphate, Change
the water 2 or 3 times & boil
test after 1 hours Boiling
Then put in 21% & Gasoline
for 2 hours,
Soak all in water until
ROH is gone as tested by
Litmus, then soak all night
~~[illegible]~~ & send to Test,

326 A 326 B 326 C 326 D

326 E 326 F, -2 given to
Lott-

327 D 70 93
327 a 62 – 124

328 D 100 – 150
328 a 123 – 205 – 247

brought.

327 1/4 Antimoniate Potash ✓

328 1/2 Arsenite of Potash ✓

329 1/2 ~~Bifluoride of Potash~~

330 1/3 ~~Phosphite of Potash~~

331 1/2 Silicofluoride Potash ✓

333D 17-57
333a 58-33

bright

334D 158-150
334a 100-100

335D 83-127

336D 147-176
336a 143-166

337D 85-125
337a 105-132

338D 18-[illegible]
338a 17-67

332 = Same as 326 except strong Arsenite Soda, boiled 1½ hours, then boiled in water

333½ Arsenite Soda 1½% KOH

334½ Arsenite Soda 2½% KOH

335½ Arsenite Soda ½ Nitrate K 5% KOH

336½ Arsenite Soda ½ Carb. Soda 5% KOH

337½ Arsenite Soda
afterwards put in water + after 24 hrs put in hot 2½% for several hrs.

338½ Nitrate Magnesium ¼ Arsenite K

339 1/2 K Phosphate Dibasic (ortho) ✓

340 1/2 Sodium Phos Extract ✓

341 1/2 Natrium pyrophosphate ✓

342 1/2 Sodium Hypophosphorous ✓
aft — Kaff

343 1/2 phosphate Ammonia ✓

344 Special - Boiled several hours Conc Ferric K then boiled (water 2 or 3 hours 2 or 3 Changes, Then Boiled 10% KOH, 3 or 4 hours, Then Boiled Water 2 or 3 hours several Changes -

342K 312 - 293 293 - COPY
342D 409 - 420 - 403 - 412 - 417 - 397 - 391

346A 192 217.
346B 133 170

347A 165 195-
347B 172 203-220

345- Mercuric Cyanide - proceedings same as 344

346 Arsenate Soda same procedure as 344-

347 Arsenite Na - same procedure as 344-

348 1/4 Arsenious acid allnight then water 10 hours changing 3 or 4 times then KOH 10% all night then water 10 hours changing 2 or 3 times,

349 D 312
349 A 427-433-400 407-383-333-343

350 D 342-363 360
350 A 404-430 403 412-417-390-351

352 A-90-120

352 B 133-150

349 = Metaphosphate K made from Glacial phos acid - with 1/2 excess of acid — Reg reduced by Current Cup KOH after

350 - Same as 349 - Except cups are again reduced by H_2O_2

351 — Special — Cups further reduced by H_2O_2 + ☆ then boiled in 349 Solution — then boil H_2O then boil KOH, then boil H_2O —

352 - Jarrosy K treated same as 344 - now put in arsenite Soda, dil right then boil in mixture in water or then KOH 10% then water boil -

353 a 182 - 353 358
353 b 166

354 b 167
" a 158

355 a 132 156
355 b 133 147 → 160 367

356 a 82 - 100 -

356 b 87 67

353 = Mercuric Cy treated as 344 + now to Gr treated like 352 it being in Na Arsenite -

354 = Arsenate Na treated as 344 + now put in Na Arsenite, + treated like 352.

355 = K Cyanate, treated like 344.

356 - K Cyanate treated like 344 now put in Arsenite Na. in little cell hot, to soak one night, then H_2O hot change 3 times + free it from arsenite, then KOH hot, all night, then H_2O -

354-1- 132 156
354-2- 133 145

359+ 169- 204-225
½ 133 150

357- K Sulfite - treated like 344-

358- K Sulfite treated like 344 now in Na Arsenite treat allnight Little cold Hot then H_2O hot then KOH hot then H_2O -

359- Na Nitrate, treated like 344

360- Na Nitrate treated like 344 now in Arsenite Na treat like 358 -

361-2 178 197
361 # 159 192

363 B 255-347-360 413-426-416-415-423 (216 Run)
363 A 215 292-320-333-358

364 B 363-412-377 392-400-361-357
364 A 353 377-367-379-386

361 K Oxalate, treated like 344

362 K Oxalate treated like 344 - now in Na Arsenate - treat like 358

363 Ferric Cit K dup of 344 now in Metaphos K same as 349 - to Gs treated like 358

364 Ag Cy - Bichrom treated like 344 - now in Metaphos K as 349 - to Gs treated like 358

365 B 312-367-375-300-308
4 a 307 367-347-353

369 c 133-210-200
367 a 147-177
367 B 193 193
367 C 123 153
367 B 177 184

366 A-263-323-343
366 B 313 342-400-327/sc

369 A 250-278-283
369 B 182-238-253

Arsenate 1/2 & 3/4
Swell the packet, used
4 packets & 1 gm each
Both swelled as usual
& breaked at Crump
The wrinkles were ok —
the 1 3/4 w/but discolor

with now H_2O
365 - Arsenate Ka Na breaked
like 344 — now put in Melaphan K
same as used — 349 —
but to 6z breaked like
358

with now H_2O
366 Arsenate Na - treated same
as 344 — now in Melaphan K
same as used — 349 —
to 6z breaked like 358

367 - 1/4 Arsenate K
368 1/2 Arsenate K
369 1m Arsenate K
370 1 3/4 Arsenate K

the arsenate is acid
all day
then H_2O
then KOH
then H_2O —
Soaked 6 hours
in the bal
now with H_2O &
after with KOH
+ H_2O

371 - not cleaned.
371A - 170 - 163
371B 123 133

372B - 138 - 163

374A 162 167
374B 115 122

372A 173 - 203

371 - 1/4 mol Arsenious acid 3 hours all day
then H_2O, then KOH, then H_2O

372 1/4 Arsenic acid. 3 hours all day
Then H_2O, then KOH, then H_2O

373 1/2 Arsenite Soda - 3 hours full cell
with Ammonia — then H_2O
then KOH, then H_2O.

374 1/4 3 hours
Arsenate K, 1/2 of the Water
to be ammonia water —
then all day — then H_2O then
KOH then H_2O -

375 - 1/32 3 hours
Oxalic acid all day
then H_2O, then KOH, then H_2O

376 1/64 Picric acid – Water + KOH ✓
treatment – 1/2 hours soak

377 – 1/64 Tartaric acid – H_2O + KOH treatment 2 hours soak

378 1/2% KOH, few leaflets Iodine ✓
2 hours soak

379. Cupric acetate Little KOH, ✓
H_2O + KOH treat – 1 hour soak

380 1/16 Pyroligneous acid H_2O + KOH ✓
treatment

381 1/16 Paraoxybenzoic H_2O + KOH 1 1/2 hrs

---

2 p.m. Even after 3 washings with water, acetone put in 2 1/2 Sabulum gut red –
377 B 280 276

380 Cups bright – Sal Light Black Brown

381 – Cups unchanged Sal Clear

382 – Sol black – Cups bright
Cups KOH, + wash ½ hour, H_2O & milky
382B – 333 – 383 – 383
382A 283 – 281 278

383 – Sol green – Cups bright,

384 Sol green – Cups bright.

385 – Cups fairly bright – Sol. yellow brown
Clear

386 – Sol brown – Cups ~~clean~~ cleaned
a little –

387 – Cups not clean – Sol. very pale green

Cup
382 gallic acid
H_2O + KOH treatment,

Cup
383 Trichloracetic,
H_2O + KOH treatment,

Cup
384 Hydrobromic acid
H_2O + KOH heat,

Cup
385 Para Toluidmonsulphonic acid – H_2O + KOH treat

Cup
386 Disulphonaphtalic acid
H_2O + KOH treat

Cup
387 Meta Nitro Benzoic acid
H_2O + KOH

388 Cupr acid Amidopropionic acid ✓
H_2O+KOH Treat

389 Cupr ~~Monochlorobenzoic~~ acid ✓
H_2O+KOH T

390 Cupr ~~Oxal Cuminic~~ ✓
H_2O+KOH treat

391 Capevic acid Meta, ✓
H_2O+KOH Treat

392 acid Bromoacetic ✓
H_2O+KOH TT

393 Orthonitro Cuminic ✓
H_2O+KOH Treat.

~~Very Many~~ ns

385 - Cupr bright. Sol float particles of ferric carbyd apparent

391 - Cupr unchanged - brown ferric Sed

392 = Sol green - Cupr bright.

Cupr is 3/4 dia
flat bottom
1/4" high of the
acid either Crystl
or liquid

393 - not cleaned

394 = Cupr. unchanged Sol purple

3940 233

395 Sol red – Cupr. faintly brought.

397 – Sol clear at edges white ppt Cupr unchanged –

398 – Sol green – Cupr. very bright. Ppt rum at all.

399 – Sol Water white Cupr very bright

401 – Cupr bright Sol. Clear Ppt brown

all these $H_2O + KOH$ treated

394 Acid Cressalinic – ✓

395 acid Rosalic ✓

397 Acid Cennamylic ✓

398 Citric ✓

399 Chlorocrotonic acid ✓

402. ~~Acetic~~.

401 Acid Sulfo anilic ✓

402 — Sal De Lemont all three
Brown — Cape Little England

403 — Sulfo Salicylic acid
Powder run at all

404 Cleaned
404 B 267 290-325

405 not Cleaned
405 B-253-275-300
405 B 267 294
406 not cleaned

407 Bright
407 B-2-0

402 Chloric a ✓

403 Sulfo Salicylic acid ✓

404 acid Salicylic ✓

405 acid tetra Chloro phthalic ✓

406 Meta Oxybenzoic acid ✓

407 Phtalic acid ✓

408 not cleaned —
after Kool aid night. Transpt flake
(Coat in liquid) not so much as
— 414 — 408B 217 222

409 "
Sand float flake —
409A 213 221
409B 213 224

410 Bright liquid grass

411 — Brn ferric float.

413 - Bright - liquid grass
413A-15-15
B 2, 0

408½ Carbonate ammonia ✓

409 1" Carb Ammonia ✓

410 cup of Succinnic acid — ✓

411 ½ acetate Potash — ✓

412 ¼" Succinic acid ¼" acetate Potash ✓

413 Cup of Malic acid — ✓

414 - Bright. deep green
also fluorescent

Fluorescence - apple green with faint blue tint

415 - Bright -

416 not cleaned

417 - Bright. shade green in deep

418 Aq ferric fluorescent

419 Bleached Cups

414 - Cup - acetic acid. ✓

415. Cup Sebacic acid. ✓

416. Cup Chrysophanic acid ✓

417 Cup Sulphopseudo-cumol acid ✓

418 Cup Hypochlorous acid ✓

419 Cup Dithonic acid ✓

420 -

421 1/2 Cane Sugar 5% KOH, boil in Nickel dish 4 or 5 hours then soak out in water

422 1/2 Cane Sugar 20% KOH boil 4 or 5 hours Nickel dish soak out in water —

423

424

425

426

427

428

429 - not cleaned

430 not cleaned

431 - Cleaned. bright.
432 DB 202

432 - only slightly cleaned.

433 - Rusty - not cleaned - Fluoroformic fluoretard.

434 not cleaned

435 - Cleaned only slightly.

436 Cleaned.

437 - cleaned

Woodalcohol Series

429 Cup Sebacic acid in Wood Alcohol ✓

430 Cup Chrysophanic acid in ✓ "

431 Cup Sulphosuccinamal acid ✓ "

432 Cup Malic acid ✓ "

433 Cup Succinic acid ✓ "

434 Cup Phthalic acid ✓ "

435 Cup Meta oxybenzoic acid ✓ "

436 Cup Tetrachlorophthalic acid ✓ "

437 Cup Salicylic acid ✓ "

438 – Bright.

439 – Bright.

440 – Not cleaned – full white fluorescent

441 – Partly cleaned

442 – " "
442 DB 137 – 245 – 327

443 – partly cleaned

444 – Not cleaned

445 – " "

446 – Not cleaned

Wood alcohol Series

438 Cup Sulfosalicylic acid ✓ Woodal 438

439 Cup Sulpho anilic acid ✓ "

440 Cup Chlorocrotonic acid ✓ "

441 Cup Citric acid ✓ "

442 Cup Tartaric acid ✓ "

443 Cup Cinnamylic acid ✓ "

444 Cup Rosolic acid ✓ "

445 Cup Cressylinic acid ✓ "

446 Cup Carbolic acid ✓ "

447 - not cleared

448 Da 200

448 - fairly bright

449 - not cleared

450 Not cleared

450 Da 217

451 - bright. yellows -

452 Bright

453 - Nearly bright

454 - Bright

455 not quite bright -

Wood alcohol series

447 1/4 Arsenate Potash + Woodalcohol ✓

448 1/4 Arsenite Soda or K ✓ "

449 - 1/2" Nitrate Potash ✓ "

450 1/4" Ferrocyanide K ✓ "

451 Cup Ortho Nitro - Cinnamic acid ✓ "

452 Cup Bromacetic ✓

453 Cup Amidopropionic acid ✓ "

454 Cup Caperic acid meta ✓ "

455 Cup Meta Nitro Benzoic acid ✓ "

456 - Not cleaned

457 - Bright,

458 Bright

459 - partly cleaned

460 - Nearly cleaned
460 Da 247 - 250 - 228

461 "

462 partly "
462 Da - 242

463 - Not cleaned
463 Da 248 - 247

464 Practically bright

Wood alcohol series ✓

456 Cup Disulphonapthtalic acid or wood alc "

457 Cup Para Toluidinsulphonic acid ✓ "

458 Cup Hydrobromic acid ✓ "

459 Cup Trichloroacetic acid ✓ "

460 Cup Gallic acid ✓ "

461 Cup Paraoxybenzoic acid ✓ "

462 Cup Pyrolignous acid ✓ "

463 Cup Picric acid ✓ "

464 Cup Oxalic acid ✓ "

465 mat cleaned

466 " "

467 " "

468 " "
468Da 183 240-223

469 " "

470 sandy bright

471- mat cleaned

472- Bright

473 Bright, nitting

Wood Glacial Series

465 Cup Pamplonylen diamine in woodalcol

466 Cup Tolidin Ortho ✓ "

1767 Cup Benzidene base ✓ "

468 Cup Metaphenylen diamen base "

469 Cup Tolunidin (base) ✓ "

470 Cup Picolin ✓

471 Cup Phenolphosphoric acid ✓ "

472 Cup Naphthalenic acid ✓ "

473 Cup Nitric acid ✓ "

474 not cleaned
after KOH. green,

475- Partly cleaned

476 " "

477BB 198 228

477- Not cleaned
478 Da-200

478 Nil Cleaned

479- not cleaned

496 W 93
495 W 144
494 W 125
493 W 88
492 W 47
491 W 25
490 W 47
489 W 67
488 W 100
486 W 104
485 W 87
484 W 130
483 W 50
482 W 125

WOG's absolute

474. Cup 1 Rd Chromic acid drywood alcohol

475 Cup Arsenious acid " "

476 Cup Arsenic acid " "

477 Cup Cyanide Potassium " "

478 fill with Alcoholic Potash

479 fill with Alcoholic Ammonia

486DB - 158
485 " 158
483 " 190
482 " 122

488DA 160
486 " 158
485 " 217
484 " 167
483 " 223
482 " 179

481 - Bright - green stubble comes out hulls in green —

510 W 179
509 " 110
508 " 92
507 " 43
505 " 123
504 W 147
503 W 107
502 W 117

486 - not cleaned in acid

485 Bright - stripped slight pinkish not

484 - not cleaned in acid

483 (not cleaned)

482

Noticed that 486 only grains with pinkish tint!

Shade of green in legume

485 - Brown green faint in 486

no green in others

480 - Boiled 4 hours in Carb Soda in Nickel dish put in water —

481 - Boiled 4 hours in Carb Soda - Carb soda - put in 1/2" Glycerite Soda all night -

482 = 500 Meta Phos Na

483 1 gram "

484 3 grams one drop one boiled -

485 6 grams

486 12 grams -

488 DB 232 246-267

489 DB 242 259

492 rather green

490 - Least ~~green~~ green

plus bright

492 - both dry ones (crusted)

almost colored on clean

496 DB 145	496 DA 199
495 DB 145	495 " 157
494 " 183	494 " 178
493 " 153	493 " 199
491 DB 125	491 " 74
490 " 124	490 " 3
489 " 176	489 " 242
488 232	

Glacial Phos acid –

488 - 500 milgms ~~Metaphosphoric acid~~

489 1 gram ✓ " "

490 .3 grams ✓ " "

491 .6 grams ✓ "

492 12 grams ✓

~~493 - 5%~~ 493 - 5%

494 1¼% KOH - 3 grams Metaphosphate beads

495 2½% KOH, 6 " ✓ "

496 5% KOH 12 " ✓ "

~~497 2½% KOH 24~~ " "

498 BD 200

Wet grain
Not cleaned

501 DA	213-321	501 BD	313
500 "	223	500 "	166
499 "	193	499 "	157
498 "	157	498 "	193

Wet grain
Not cleaned

498- 1 gram Metaphos Soda in water

499 3 gram " These to soak

500 6 gram " Cold-mat

501 12 gram " to go on heater

~~502 12 gram~~

502 1 gram Metaphos Soda 22% KOH

503 3 " 6% KOH "

504 6 " 11% KOH "

505 12 " 21% KOH "

~~506 24 " 42% KOH "~~

The Celloloid Ni Conc out
with Sol- after peeling in water
it not bleach out seems Ni were
reduced by current applied, by H_2O_2
used - 1%

Nickel underlaters

509-DB 252 274-308
" Da 232 252-260

All grain beyond

510 Little cleaned
other not cleaned
after changing beyond + peeling
in water - it got muddy

Possibly the action of phosphate Can be used
to do same thing that Bicht, + 33 does,

509-DB- 252-295		502 DB	173
5		4	
508 DB	143	510 Da	27
		509 Da	232
507 DB	143	508 "	176
		507 "	177
		505 "	153
505 DB	196	504 "	194
504 DB	220	503	156
503 "	193	502 "	80

507 1 grain Sodium Phosphate ✓

508 3 " ✓ " If

509 6 " ✓ "

1 drying bucket

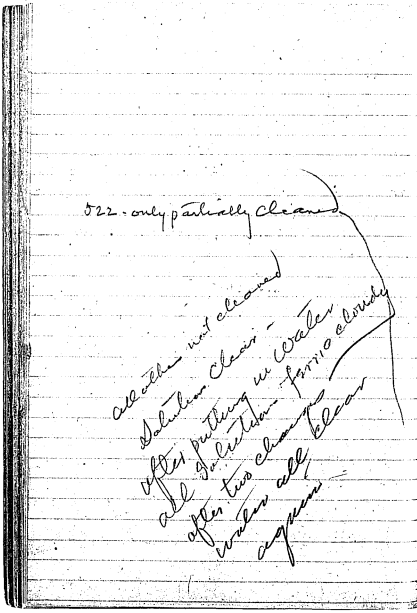
510 12 " ✓ "

512 1 gr. Glacial Phosphoric Wood al

513 3 " "

514 6 " "

515 12 " "



Grams

520 2 Iron from Eadcell in 3 grams Metaphosphate Soda

521 ditto 6 grams "

522 ditto 12 grams "

522 2 Irons in 3 grams Metaphosphate Soda in ~~5% KOH~~ water

523 ditto 6 grams Metaphosphate ~~5% KOH~~ water

524 ditto 12 grams Metaphos in ~~5% KOH~~ water

525 2 Irons in 3 grams Metaphos Na in ~~5% KOH~~ water

526 2 grams in 6 grms Malaphor H₂ — 21% KOH,

527 Ditto 12 grms —

528 3 grams from bad cell boiled in 21% for 6 hours.

529 = 3 grams from bad cell boiled 6 hrs with 21% KOH. Contaminated 1 gram Cu oxide dried + Washed in Jugol 21% hot twice afterwards —

Sal Colorless — 530 BD 143
529 " 150

Yellow Soluble float ferrous

Yellow Sol-float Ferric

after putting above in
Water Soluble becomes
Colorless —

430 DA 200 247
" AB 138 174

531 DA 137
530 " 157
529 " 143

526 Old news from Sad Cake
12 grms Metaphos Soda in 5% KOH

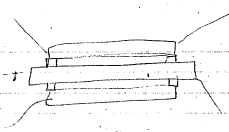
527 dutto
6 grms Metaphos Na in 2½% KOH
1/2 water

528 — Dutto
3 grms metaphos Na in 5% KOH
3/4 water 1¼% KOH.

Nuckels
529 — 3 grms Phosphite Soda in 5% KOH

530 6 " " " "

531 12 " " "



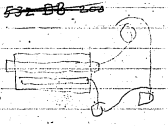
170 - 10 amp -

150

170
150
20
17 | 3 2 | 19
7.20
1.53
1.5

538 wet 475
537 " 498
536 " 507
533 W.B 500
532 " 500
533 W.A 508
536 W 508

~~532 BB 500~~



532 = 3.2 Reg Nickel - 10% with Reg nobs - Run on 71.1% Reg - give me the Nickel if they have been compared I want to treat them - 12½ to be soaked all night Malaphos Soda then H_2O then KOH, then H_2O

533 Dup of 532 5 grms

534 " " 2½ grms

~~535~~

536 Treat in Phosphate of Soda 12 grms

537 Dup of 536 6 "

538 " " 3 "

5·55

548

543 W 380 — 390
542 W 417 — 422
541 W 473
540 W 485
539 W 497
538 W 430

537 W 480
534 W 502
533 WB 492
532 " 513

542 BD 327–348
543 BD 360–378
544 BD 360–376
545 BD 395–427
546 BD 383–397

542 wet 425–438
541 " 476
540 " 497
539 " 509
538 " 479

543 14th run 4

Notice Mr Comes out no Solution perhaps 5 milgm – also from

Noticed after keeping in water 3 hours with 3 or 4 changes Called drank Mr floaty but only cut little down side – Quickly put it in KOH 21/2 + put in water

539 – Same but treat with Arsenate K – 12 gr

540 Drop of 539 6 gram

541 " " 3 "

542 Glacial Phosphoric acid (Merck CP) sticks dissolved in water – guess about 4 oz in 400 cc – then kept adding 33% KOH till about neutral, perhaps shade alkaline by paper – if it fully alkaline solution turns yellow – Thus solution was poured into cells Containing various weights of glacial phos acid – 542 – Contains 1 gram phos acid with above solution to soak all night but

Practically Neutral

543 acted same as 542 as to Collow coming out, put Rock in 21% + put on heat

544 also given it after 10 minutes more

543 W 392

All these solutions

W. Conway out — Collow — but slow — 15 & 20 minutes in 12 — but does Conway out in Collow Solution — Conway out in Collow Solution in water

	1st	5th
547 - AD	200	
546 "	367	
545 "	367	
544 "	394	387
543 "	357	372
542 "	348	

546 BD	352
545 "	433
544 "	337
543 "	397
542 "	344

543 Dup of 542 - but has 3 grams glacial Phos a almost neutral

544 - Dup of 542
6 grams glacial
little acid,

544 S	396
543 W	400
542 W	423
543 A	381

545 Dup of 542
9 grams glacial
strongly acid -

546 Dup of 542
12 grms glacial

547 Dup of 547
15 grams glacial

548 BD 373

M Comes out

549 No M Comes out

M Comes out,

548 BD 242 – 262 549 AD 200
549 " 143 – 158 548 " 257

548 Dup of 542
20 grams glacial —

549 = 9o Solution of 542
decidedly alkaline — yellow —

550 - Reg M in frame put in Solution of bottle 542 —

551 Reg M in frame put in Solution of bottle 543 —

all solutions except 553
previously, 553 colorless.

Copyright on 556 555 554—
others not claimed—

Very large precipe 556 most.
553 least.

552 BD 127-123 554 AD 267
553 " 244
552½ 90-93 552½ 300
552 219
554 BD 178-213- 555 BD 313-344, 353
555 AD 344 433 - 435 -
553 BD 233-230

I now make a big lot of glucose water plus acid neutralized by 33% KOH. until slightly yellow tint + slightly alkaline to Rhodamine paper.
2 lbs Merck CP glucose
1000 cc water = 1 lb is
assumed probably 50% -
Check by adding the 33% KOH to this solution called Standard — make following

552 = Put in Cell 100 mls glucose Rhozafull strength standard solution
552½ only standard sol - ✓
553 - " 200 " " ✓
Soak in H2O
554 400 " "

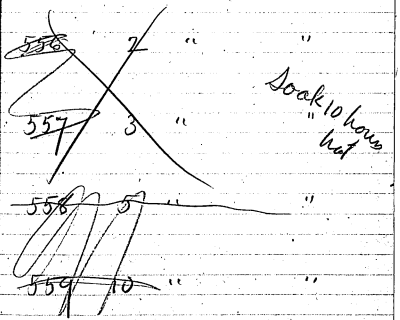
555 BD 313-344-353
555 CD 435

556-BD 133
556 CD 133 147

555 CD 443

555 put - 600 mls glacial L

556 1 gram " L



all tinted a little 564 most. 559 negly clear
564 cleared cap other not cleared

Precipitates very little diffrence but those 559 apparently gives 3/4 of volume 564 does—

Bigmentate Daddy put 33% in methanol water was in 3 hours pretty sparkly those look it out spot water — those not will pretty next difference.

462 DA	223	267	
465 "	198	227	
466 "	180	208	
561 BD	220	223	348
562 BD	193	208	
562 BD	125	142	
563 BD	133	144	
559 BD	160	190	

564 BD	163	194
564 AD		290
563 "		300
560 "		207
559 "		217

@ 559 - plain standard Diluted 1/2 L

560 - D'Ilute standard solution 1/2 put in Cell 100 milq glacial

561 ditto 200 " L

562 " 400 " L

563 " 600 " L

564 1 gram L Soak 10 Hot hours

565 " "

566 " "

567 " "

568 " "

568 on all night - no color -

569 ~~Color~~ no color -

570 no color

571 no color

572 - no color after 6 days on all night

573 no color

None of Cups cleaned

Except 573 -

green willow + pitcher maker

Precipitate 33% 573 plant size unchanged, 572 - small amount
271 - size unstable, 270 dirty. 569 Pea 568 - Nothing

573 BD	198	185	
572 "	157	167	
571 "	143	149	
570 "	180	173	
569 BD	150	160	
568 BD	177	193	

The dilute glacial acetic acid had no damaging effect on size of pieces

568 - 3/4 H_2O 1/4 standard glacial ✓

569 = Dilute the standard so 1/4 ✓
standard 3/4 water -
put - cook 100 mlg glacial

570 " 200 " ✓ "

571 400 ✓

572 600 ✓ Soak 10 Hours

573 1 gram ✓ Hot

574 2 "

575 3 "

576 5 "

577 10 "

573 BD 178
572 " 232
571 " 223

578 Free strength standard + put in cell / 100 milg glacial

579 200 "

580 400 "

581 600 "

582 1 gram " Soak 5 hours hot

583 2 " "

584 3 " "

585 5 " "

586 10 " "

587 - Put 1/2 strength of dundaro
for incock 100 mls/glaccal

588 200 "

589 400 "

590 600 "

591 1 gram " Soak 5 hours

592 2 " "

593 3 " "

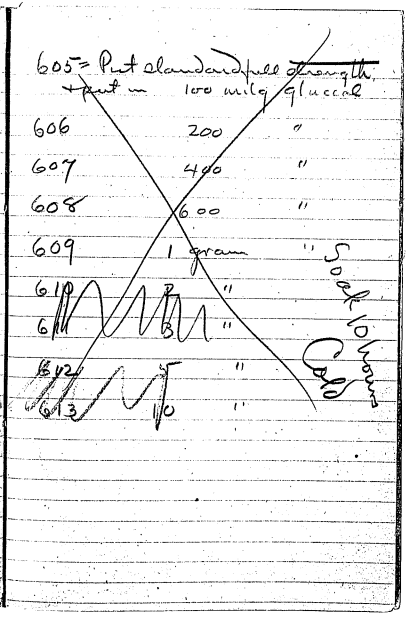
594 5 " "

595 10 " "

596 - Put 1 pts (and 3 pts water
on each with 100 mlq placed

597	200	"
598	400	"
599	600	"
600	1 gram	"
601	2 "	"
602	3	"
603	5	"
604	10	"

Soak 5 hours hq


605 = Put standard full strength.
+ put in 100 milg glucose
606 200 "
607 400 "
608 600 "
609 1 gram "
610 "
611 "
612 "
613 "
Soak 10 hours
Cold

after 10 hours calcium colorless
Hull rotate fluorosyst
Chipsnut cleaned

616 615 614 - Remedy any visible precip-

~~seedlings~~

615BA	168	192
614 "	210	225
613 "	177	183
612 "	57	192
611 "	220	223

615AA 207
611 " 223

611 1/2 standard 1/2 H_2O plain - ✓
612 - 1/2 standard Distilled
100 milg glucose ✓
613 200 " ✓
614 400 ✓ "
615 6000 grams ✓ Soak 16 hours
616 ~~1000 grams~~ ✓
617
618
619

after 10 hours Solution Colorless
Cupernet cleaned full
white flocculant, Cupernet
cleaned —

616 BD 210 220
617 BD 117 123
618 BD 167 186

620 BD 190 207
621 BD 190-167
622 BD 0-6-

621 AD 242
620 " 220

615 BD 188 192
614 BD 210 225
613 BD 177 183

617 1/4 sl. rinsed 3/4 H_2O clean ✓
618 1/4 cleaned 3/4 water ✓
100 mlg acid cleaned

619 200 ✓ "
620 400 ✓ "
621 600 ✓ Soak Cool
622 1 open ✓ 10 hours
~~623~~ "
~~624~~ "

Cups not cleaned -
The dark yellow color of fluorescent precipitate bottom had at 1st disappeared. Solutions nearly Colorless -

~~All~~ Not sized covers precips in all.
629 has the least 625 ppt.

All Solutions alkaline -
629 strongly alkaline

625	BD	225	226	
629	BD	150	181	
628	"	200	217	
627	"	185	198	
626	BD	150	152	

628 AD - 233

625 - Standard Solution. 100 milgms KOH slide

626 200 " " "

627 400 " " "

628 600 " " "

629 1 gram " "

630 2 grams " "

631 [illegible]

Notice 630. Light yellow gradually goes to deeper color until gets to 634 which is red yellow + strong then it gets lighter color to 637 — 637 has a precip like others also but not so great 630 the least,

20 | 5000 — (250
400
500
100

32
96 — 16

20 —

3. 3/4
1 3

250
75

Standard Sol decidedly yellow —

630 - Standard Solution - undiluted, 2 grams Stick KOH.

631 3 grams "

632 4 grams "

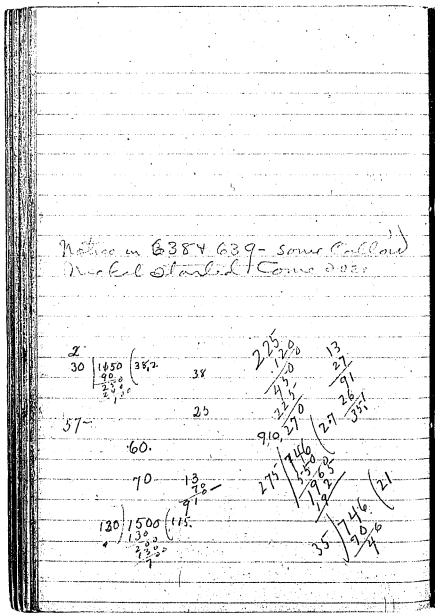
633 5 grams "

634 8 grams "

635 12 "

636 20 "

637 30 "



638 Standard solution diluted half — 2 grams alcohol KOH

639 3 grams alcohol KOH.

640 4

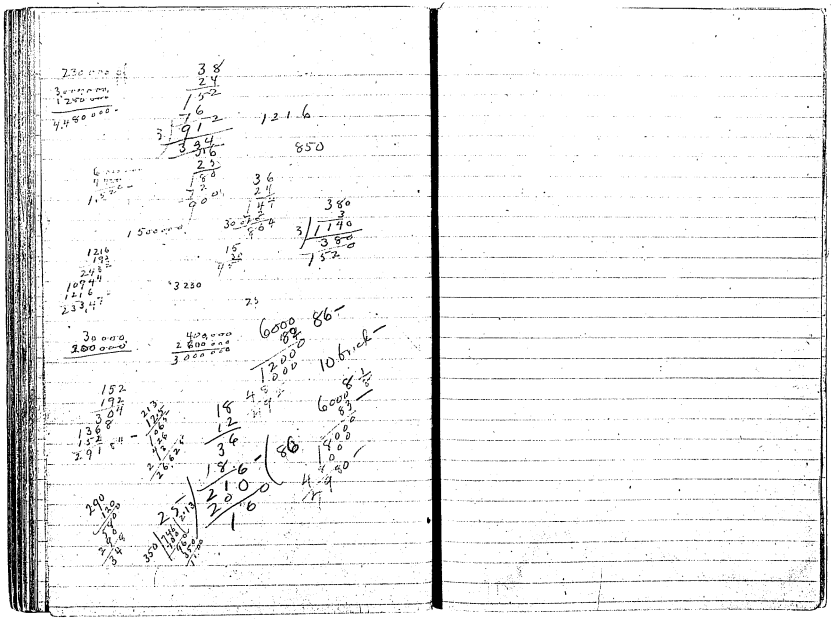
641 5

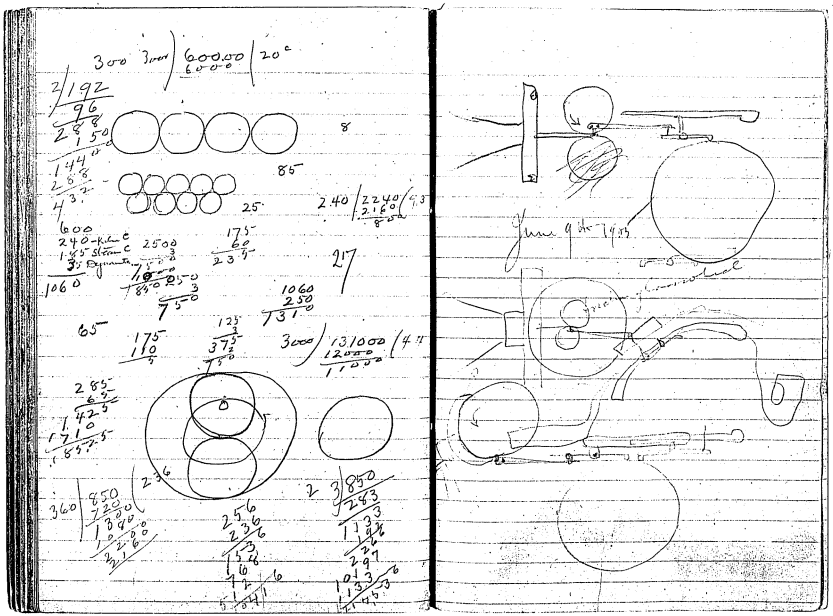
642 8

643 12

644 20

645 30



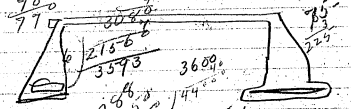


4 × 4 — 10 — 10

6 × 6 — 15 — 10

9 × 9 — 22.50 — 15

12 × 12 — 30.00 — 16



E — 12 — 6

6 — 6

E — 4 — 4 — 107

E — 6 — 6

E — 9 — 9 — 15

E — 12 — 12 — 20

E — 10 — 4 + 4 — 10

6 + 6 — 15

Notebook, N-05-02-07

This notebook covers the period February-June 1905. Most of the book contains notes, primarily by Edison, regarding storage batteries. Among the entries are items pertaining to the preparation of nickel flake and to the loading of the flake in the tubes within each cell. These entries were witnessed by Frank L. Dyer. In the middle of the book are abstracts relative to the nickel preparation, which an unidentified experimenter copied from scientific journals. Near the end of the book are lists of cells to be used in endurance tests. The front cover is labeled "Tubes Record." The pages are unnumbered. Approximately 140 pages have been used.

Feby 7 1905

Mar 23/05

Try reversing old pocket 24 hours Weak Bromine water to eat any iron out - dont think Br will hurt plated as much if stopped right Time.

Get drawings of Mixer made for mixing Enc Lights Carbons made for Cleveland plan

Make some Nickel flake coated Silver both sides -

Make some Copper flake coated Nickel both sides -

Make some Nickel flake Coated Copper both sides

Make some Nickel flake coated Bismuth both sides

Feby 7 1905

Make some Nickel flake coated Cobalt Bath acids,

Obrogist make some more 6 8 10 12 % Hg –

Reverse an iron (+) anode + test out all can by Bromine see if it runs –

See if can obtain Ni flake on thro 20 mesh NiOH by mixing mushy nickel hydrox pretty thick –

Chloride Fe pass H over Calcium hydride and HCl absorb in H_2O –

Oxychloride Nickel – think NiCl dissolves out of NiOH this would often drying powder in product could reject some but if so would try to get proper process obj

Feby 7 1905

Chloride Nickel Volatilizes in Spangles like Mosaic gold can't be reduced by H to get flake Nickel

Precip $Ni(OH)_2$ leave Na_2SO_4 + with Excess NaOH Boil then semi dry but still paste plastic then paste in Cups + dry then press + Corrugate then wash hot water till SO_4 free Thin Cake no graphite. also powder Coat graphite + use regular — also with flake Nickel Molasses — 1½ grm —

Antimonide Nickel Thin plates, by fusing 2 atoms Nickel with 1 atom Antimony, Watts Vol I. 316 —

6% Bismuth with $Ni(OH)_2$, New process 8 & 2 flake Nickel fingers mfg smallest amount explosion possible 2 Cups in 1 grid .0003 flake Ni also group flake Ni thro 100 mesh

Nov 1905
Sept 4 1905

7 Feby 7 1905

Mimosa can treated to free of gum by fusing KOH, also acids or also hydrofluoric.

See J Gubkin Annales phys + Chemie [2] 32 p 114 - method making films - Edinburgh Chem S Jnl 1888 p 101 says current passing from surface of a liquid into air or a vapour - Vac - or gas about it gives films which float on water (Rayleigh) Isobel to us as a plating sol.

Basic Mercuric Salicylate + Na Cl + KOH. without change to pp by CO_2 + acids! Lajoux J Pharm Chem 1903 VII 17 412 418

Cup filled Ni Red by H then act on with Current in Hypo in weak KOH - Hypo see if goes to NiO_2 -

Make Ni film 0003 0004 0005 0006 - + Hyf mesh + coat Ni -

Feby 7 1905

Jennings
Ni
Carb Ni pressed in Cup + whole reduced by H. then hydroxide Ni got in by soaking + pp Salts,

Groups grew in KOH each group finger coat with flake Ni with less + less Molasses — 8 + 2 — 1½ 1¼ 1 3/4 grams —

Cup in grid with powdered KOH, then dip in Ni SO4 until whole pp —

Cup with powdered dehydrated Ni Sulfate Corrugated then suspend in Nitty Gas dots on them in KOH, also Alcohol + KOH. if swell too much add to KOH powder K SO4 powder

New idea — Parchment Cup electrode in Carbon, KOH, + Ferricy K 7%
Conc Ferricy in parchment dots as depolyr — possibly Saturated Ferricy in KOH, + Solid powdered Ferricy K in parchment Cup

Feby 7 1905

Molasses flake Ni-green- make ten dips in Nimine after final Corrugtn.

Plain green thro 150 mesh 3 grms after Corrugtg. 10 dips in Nimine ditto thro 200 mesh

Make stiffish NaOH paste gelatinous, paste in Cups + Corrugate let it squirt out what will, clean that off —

Precip Ni Sulfate by excess KOH, boil — dry- powder thro 20 mesh + make a graf no graf — also graf also Ni flake if graf works

Week 2 Mar 5 D
Feby 7 1905

Groups M Reduced Cy H
3 grms KCy in KOH / see of
action KCy will make it
active,

Nickel amalgam squeeze out Hg Cy
bag & hydraulic see if gets active, /
KOH, alone or with KCy 3 grms

Groups grids saturated with strong
KBr & then immy put in 21%
chgd & run Hg

Charge discs groups in 33% till
absorb good big Capacity,
then when Chgd dry & take out
mix powder warm gently &
put in new Cups
drills, after discharged, in 33%
Run in 21% Police Shell
drills both after chg & disch
in 33% Soak out in Water all
KOH & dosame Immy

Vol 3 p 40

Feby 7 1905

Will Carb Ni dry be reduced by hot NH4 to form Volatile Carbonate, if so it would leave the Ni only Brass, would it be active, How about Leg and Ammonia — would result be active, or attacked by Hydro Would Oxalate be decomp by Dry ammonia —

Is Chlo Nickel decomp by Absolute Ammoniated Alcohol

Set up in pressure room Cell with alternating Current to make Nickel hydrate according to Nef Mans patent — also get Calcic he gave me dry + test it — get his patent —

Feby 10 1905

Will Carb Ni go muchly if acted on by BaO_2H_2 when BaO_2H_2 very dilute —

Work up method forming Ni_2O_3 by Electric Method (the kind that will not settle) + wash several times with alkali —

See if possible make flake Ni sulphide by acting on Ni flake by H_2S hot — its possible there is too great a drop of EMF Get a good Carb + Ni_2O_3 + then a decomp action which would take place if flake was poor Conductor like graphite — The Sulphide would Go even poorer than graphite —

See if Nickel film could Go Chloride to a Nitride by heating in Ammonia or other gas

March 2 1906

Feby 10 1905

Examine the remaining two cups
Each group in at the Endura
with cups plated Cu Ag Cd Zn

Write Jim Whitty see get 004 or
005 strip Magnesium Reg width
+price

Is there any Ferro of a metal
not decomp by KOH if so
Cared out as dep charge

Put highly polished Nickel
strip in KOH, 100 cc Containing
5 grams Aluminum see result of
Current, dettle 3 grms KI
by weak + Gray Currents,

Do Vanadium Rods Iron pickups No flake
Cond also blushed by Va oxide which is
a Conductor, both oxides (lower) are
Conductors

June 1918
9 A.M.

Try Palladium Ni strip + deposition in Vanadium Solutions —

Cross scratch 100 mesh the Nickel plate for forming flakes Ni on flake Gr Crumpled,

Try recalcinate high Carp 33% dis + chg Ni by reducing at Cathode half + soaking out KOH, + pressing Argon to further reduce — see if lumps are still there, also try without reducing + while charged use 5% KOH to pass it so as not decompose

A group charged 21 dis 33%

Another charge + discharge twice in 21 discharge once in 33%

Groups with NiOH from Evap of Mannich — with + without graphite flakes pellet Nimonic and aluminum

Jan 22 1945
9 P.M.

Chg dis then chg — 21/2 grams of this dry with KOH in them powder warm put in new Cups —

ditto get all KOH out

ditto leave KOH in but do ~~not~~ it in discharged state,

ditto Wash in alcohol

ditto chg + Discha in 33% Wash out with alcohol + put in new Cups

ditto chg dis + Chg 33% Wash out alcohol —

All the above to have 3 or four runs so as to get right Capacity Before they used

Lunch 1½
8/20

Chgd dia after 4 runs — 21%
Wash all KOH out by alcohol
+ 2 runs without pulling in new
Cups —

ditto charged

ditto 33% chgd

ditto 33% dischgd

ditto 6% Bismuth in KOH,
after 2 scrubber runs & 21% dia
+ wash alcohol + put in new
Cups

ditto Chgd —

Boil in KOH 5% — old N°26
Cups several hours, see if get
red dead out

also soak Alcohol warm to
get KOH out, remove Carefully
Weigh thrax powder +
put in new Cups

June 1961
9 2 0

Dave old #26 cups + put req
mix in see if OK —

Chg in 21% grump — wait 24
hours dischg thru chg right
away let it [illegible] clays 24
hours + dischg — then to allow
KOH soak in —

Run a Curve on Magdalena
batting Holland dont,

Make one with 6g grain
Reg mix to get liquid
Elastic —
~~Use~~ Spoldeep Cups —

Jan 26 1926

Make Extra deep Cups + use
longer molasses Dissolve at same
Medium + 6 gram Cake

Group M flake 1½ molasses
Comp Cake + Hair soak out

Group 2 Cups to a pint qwz
to Warm to Clg + also 33⅓
for Cold Leads

Acetate Ni dissolved in Glacial
acid, then Chloroform to precipitate
also, KOH anhydrous to
Neutralize Glacial + form
acetate K - dissolve out
see nature of NiOH,

Anhyd Ni Chloride in Glacial
acetic, Chloroform,

Mark 3/10
8/2/

See Holland about
Endurance of this really
get proper dig + dis

Strain Ni Saponified
by Hypo

Some green NaOH. by ∯ Sulfate
so that is always 3 to 4% in Sol
of free NaOH. Sulphate put in
40% slowly + other it gets
to 33% add more NaOH, base
of nature of NaOH change
of any group in chain with
flake graf best proportion

Nov. 1915
3 grms Green chlor 15 hours
only take 200 Mesh out
& reclog do this 3 times
then make a fuse electrog

Flake Ni plated both sides
Copper

ditto Silver

ditto Bismuth

ditto Thorina

Flake Thorina

Flake Copper plated both
sides Ni.

Flake Copper plated both
sides Ni then Bi

June 1916
9:20

Probably a Crude Thorma solution
got by Using Mercuric fusing
with Oxalic K S L or K_2CO_3 +
then Sulphate the whole out
thermia plate out —

Ralph dont fail make Enough
Cobalt Oxal red by H, for
4 groups with + without Hg
to be used as now + also a —
Ni — with + without grafite

Just the thing — Cups heavy
plated Cobalt + welded
get drop Emf — also Cups
plated Ni then Cobalt
+ welded —

If possible make a groups
with perforated sheets Magnesium
oxy Alloy in Each side of
Cups using Beg mix + also
plain grizzly

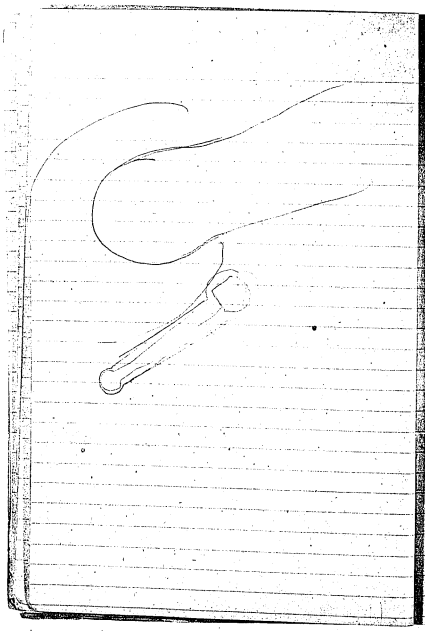
June 1916
9.10

The very Cobalt and Nickel get when Expelled with Na Citrate in KOH, dried + fried

Use of Can plate out anything from Ni dissolved in KOH with Citrate, also Tartrate, possibly powder OK —

The greater the Nickel surface outside a Cup, the less will be the internal grasing with a given charge. Same with rotor — Try to cell with 2 Zn 1 Ni - but outside Ni surfaces 10 times the Cup surface + run charge Curves.

Benzol + Rosin to attach flakes Ni on green



Alcohol + Shellac filtered

Beyol & Caedlin pitch filtered —

Gutta + Beyol filtered

Ralph reduce low temp. Sink Ni salt by H. Heat is bulky + voluminous shapes Can put down kinds in a little metallic cup with several Compartments,

Try 7+3 flake Ni rolled Nickel sink with KOH,

Fingermix Ni flake minus Nickelous, Flake through 50 mesh ditto 80 mesh ditto 120 mesh

Journal 105
9/10

It is probable that Carbonate Ni dotted on by Hypo the OH taking place of CO_2 will still preserved pieces as they hold together + give a porous NiOH pseudo Oxalate + other organic salts. Ni which can be Oxidized by even Geller showed not yet think by any free alkali — Hypo

Carb Ni in grid + then treat Hypo — plain with grid + Ni flake

8 + 2 — Flake Ni 1 of the Ni flake through 120 mesh + put on 1st the other 2 thru 40 mesh + put on last Minimum Sugar less than 2 -

Diman - assay Corrs - of Drill holes
Shewmakers

Set up two rolled out Magnesium
tape, free oxide rolled .002 thick
assay Cu minimum = 21% KOH
see of stable -

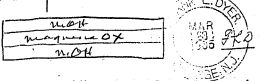
See how thin Can roll Magnesium tape
annealed to free oxide - several pieces
together,

Burnish Nickel reduced by
Hydrogen to flake it also
by rolls moving reg a one
roll faster than the other
try Ni salt which when
rolled by H, Each particle
same size so flake Even

Plate Copper .0003 + on Each
side .00005 Nickel -

Buy Magnesium powder +
burnish to flake of different
rolls

Reg Cupes 1st part — 1/3 batch.
of 3 ground green — Nickel Magnesia Oxides
1/3. Nickel green Ni OH.



The MgO affording a clearage of Ni OH.

See Dyer file pictorial flake Ni & process

also plating asbest graphite Ni rotating bbl

Have Cooley draw Curve of loss of Capacity by Cell Endurance for each of the runs, to Compare with little Cells

Make group tough Ni — 820
256. NaOH. 1.86 Nifake - 6g
sme tough - temper - Nbalassas —
Thus is 58% $NaOH_2$ —

Look at Talc under Mineral (10)
French chalk use of powder
of flaky - possibly scale in
Ni salt. Ammine for inclusion
Hydrocarbyth.

Try dif plating Solutions for
Ni film - possibly some hard
plate Ilum all right Cyanide,
Double Oxalate Chloride
Acetate etc

Try iron as Eating base
with Zinc on highly
polished Nickel possibly
give more coherent film
also try plating Zinc 1st
bottle surface

Feby 23 1905

Try fund something to do away with use of Benzol & Beeswax to get film tough

Try amalgamated Electrodes

Diman assay cores of drill holes Stewartsville

Set up 2 thin sheets Magnesium in 21% ammonia chloride continuously — ng-

Plate Cu very thin & tough with Ni on each side .00005 Cu for the same Gold seeds then give tough flakes —

Reg Cups - Green Wax, Layer green 1/3 layer Mg O 1/3 & green 1/3rd to make internal Reservoir for KOH to give Elasticity -

See Dyer about patent flake Ni Co etc

Words Benjamin drawn can see objection of platted + welded + keep ships, not objection Cole

See if Cuprous + ic scales Conduct Conduct at all —
Also Sulphides Ni - also Norway Hewitt Vanadate Fe -

Try flakes Sulphide Ni -

Try Cupro Ni sulphurised slightly not by HS — Letts Nitride purified not by Nitrig —

Try annequeen pressed in press + distilled in H or Vac till temp pyro - test

Try NiH_2 in Hydrogen between 190 or 215° dep to dehydrate at test in cell for ovoltage capacity

To make Hydrate safely from Na- passed decarbonated dry air over it till all Na_2O -

Try deposit or roll on sulphur as Electrically in KS to form Conductive Sulphide in sulphur as Thus to deposit Ni + see if it will self peel off -

Reverse a KCy (already) + Highly grease so as to plate Ni on graphite, then soak out KCy + put in new 7± -

$720

fine some Ni crystals that — are uniform in size & regular 50 to 100 — reduced by ℍ & roll out to flake by using oil stained 6x obj Cube

Try NH_4 to Grind old XO 26 Cell basalt —

Grind in cubic ball mill in jar and in Cups — ditto green ditto jar mill — water —

Ni flake deprived from Ni Carbonyl

Ni_2O_3 dis in NH_4 Evap in cylinder to film & Scraped off in 60x & Red by ℍ.

Powdered Specific reason powdered 200 mesh use Hg_0 & see if an oxidation Mn ores in oxalic & nitric & formic —

Magnetite powdered & dropped

GEO

Varnish of Ni acetate in thin layer decomposes by heat + reduced film by H_2

Squint Rosenate or Schmidt Nickel nitrate + Oxidize Oleate out - squint + in film shape by Oleate

Squint $Ni(OH)_2$ paste by $CH_2 = Hg$ —

Squint $CaOH$ nitro sulphite Ni

Possibly Phono Cyanide from an amalgam Ni ground before boiling Ferro hard —

Make 66 to 33 % Cu amalgam distill of Hg + take on cacl of formerly R in H_2 or double U-tube only —

Possibly by means Sn. Pb Zn Cd
Cu Ag Al Mg Au all together
they will not crystalize & make
a good record Cylinder
for phono when pressed —

Cobalto cyanide of Ni soluable
in NH4 when slowly evaporated
leaves crystalline scales —

Ammonio Ferrous Orthophosphate
in pure Ammonia when boiled
with KOH. decomposed leaving
Ferroso-Ferric Oxide preserving
shape of Crystals —

Ferric Ethylphosphate
Straw yellow film

Nickel Diethylphosphate
Crystalizes in prisms of Lavender

220

Bromide Ni anhy scales
Iod. " " "
Red by H –

Potassium Barium Nickel Nitrite
Microscopic tablets

Sulphocyanide Ni crystals powder

Ammonio Sulphite Ni Cryst pp

Amylsulphuric Ni Laminæ

Ammonio Copper Nitrite Cryst powder

Ammonio Dithionate Ni Tablets prisms

Metatungstate Ni Tables

Adipic Acid Ni Scales

Bismuth Chloro Selenite
Bi Ammonio Chloride 75 T. 30
grms per Litre Cold –
Ske Classons Electro anal –

220

to make Mn peroxide. Electrolytically
use acid bath Solution MnSO4
Cream Soution - dens MnSO4 in H2O
Little Sulp. Acid
Wernicke, Zeitschr f Chem (2) VII 867
Pog Anal CXII 109

Lelande use cylinder with coil
plates as anode junction Bunsen
Pouet. platinum 6 cells 1 plate
Precipitation.

Recipe to make in old packets
sweet chocolate in plain
to those who get full acid

Ferric from Oxalate gives Ferrous
Ox at 45° in 6 hours. Neutral
in 12 hours —
at 35° Magnetic iron in 1 hours
Ferrous Ox 10 hours Neutral 36 h
Thus for Ba Fe(C2O4)2 get non-pyro
iron ferric —

Perhaps deposit of Mn_2O_3 like deposited well scale easy appearance on brushing (Test red by ft —

Try put MnCl on by Cmc N_4 Thiosulfate get MS scales

MnO_2 Cover in K Permanganate (fused) in presence NaOH Crypt in Micaceous Laminiz

Na Metharam gives deposit Laminiz — $2MnO.K_2O.As_2O_5$ —

Septemb Compt K 110 405 408

Suppose alternate K + Mn NaOH + Glow lamp bubbles, make film, Oxidyl + Red by ft.

Collect all Cl on Lab + make Mn Salts see if get scales — OK - now get

ZD

E.M.J.

To obtain Nitrate by genuine
use NaCl + the alkaline salt
of the acid with excess of Acid
NO —

Salt which acts as buffers
or by themselves when heated
to redness form NO — Lumps —
Crystals — Formate, gummy — Cubes
Buff — Mercuric Acetate Salts.
Sulfate — Mercuric Acetate Salts.
Sulfate — Mercuric Acetate Salts.
Sulfate — Mercuric Acetate Salts.
Chlorate Carbonic fair deal must
of Chloric formerly

Metal Iodide combine
Deliver fibre — also Platinum
surface by Platinum Zinc
to make Deep Colored Test
Shielded Hydrogen

Iodized Rare metal plate
film —

Apt pulverized nickel plate a fusion of V.a 1140 Cr 1/2 WO3 also Cu, Ni plate with same metals base of Cu chemist if they are oxidized in 33% by density

Group flake Ni 743 flake Ni rod in H, Metal ammo — 2 rods out big jar —

Group two a fusion process Ni flake 743, Mn ammo soaked big jar — also Rolled KOH moist rag rolled over also 743 Ni flake Ni fulminate rolling — out Mn ammo or Ni alloy —

Put clamps on 2nd Ni plate cell 9 mark 4 rec of it upstairs Capacity

Warren under Micro particle Ingot on plated Ni, silver, Copper other metals, opposite, etc

8&12 of insoluble Z to 200 mesh
quartz with much Ni - dry &
brush sieve thro 20 mesh 3.12
Cake to see if particles pass thro
has nothing to do with it - 3.
green also 8&12 Magnesia -

Group No of Cake from Nitride has
form of Cake - also Sulfide
has form of flake -

Make 2 Ni oxide samples dilute
Mixing with insoluble Z Compare
Coated with Ni_2O_3 ashy from
ignition of Nitrate Ni - about
Ident loss Ign -

Warren test of Ni_2O_3
Ashy is combustion in
KOH! possibly best way
test for Cake MgO
Soaked strong $NiNO_3$
but up to peroxide -

E.E.O.

9 pr a meke Mellitale Hq
Acc of Cmy rqd -

9 pt several baskets shown
foil + make groups
7 + 3

Cmd group make Cups with
gratte, make cmy, Rq mys so ak
make assistant

Mq O. Cake, then so ak in Wales
fair among Mq Cf. to show
the apple mfg tht found bogether
detail stamps pod before spending

40 inch grass Red mark by
Eva Fut in Cups
+ baskets by Cambert

ZLO

Cakes for parano Ni cake by Soaking in R 6yth,

Phosphate Cd, Sr, Zn Ba, Mg Cd, Cu Sb, Then make in cakes with a binder possibly phosphoric acid to make a Gardner plug (pressed) + baked then soaked once or twice with or without salt formate, oxalate, etc or nitrate, to form insoluble of intercalating + leached by H2O, or soaked in mild tannic, baking soda — Wash with R.O. H2O then Extract out Phosphate by H2SO4 or HCl — then parts Cakes in grinder by blade sets or in grinder with spherical balls 6yth to crack plates to grid — then filling parts by successive dropping + shaking for Cond Blake Soaks or Nothing Nty —

220

(Cake Mg- soaked some water or HCl & hardened)

Cake Ni R by H, then soaked in Ni salt soln & reduced by H, then fused & compressed by R by H - for Raney Ni act. & making the porous Ni active by acting on it by KOH usually NaCl or Hypo & thereafter with some KOH. Also Ni Oxide reduced wherein powder & cake formed (called WILL Ka waste process) then Ni by H from Oxalate.

also Cake 50% Fe_2O_3 50% NiO — mixed with KOH as binder & pressed in Cake & Fe Ni leaf H. The new Raney cat/by Acid Can vary the proportion

also Fe_2O_3 Cake soaked Ni Salt Reddy H then Raney Ni cat/ Ni Oxide got by Soaking process —

2 x 2

MP of fluorides: CaF_2 520
ZnF_2 734
SbF_3 292

Chlorides: $CaCl_2$ BP 185
$CaCl_2$ anhy 723
$CaCl_2 \cdot 6H_2O$ 28
KCl 730
$MgCl_2$ 708
$MnCl_2 \cdot 4H_2O$ 87
PbCl 500
$ZnCl_2$ anhy 262

Oxides: Boron trioxide 577
Chromium " 200
CuO - Red heat
K_2O " "
MnO_2 759
PbO - Red heat
Sulphur — 204
Antimony trioxide "

Ba Chloride 400
K " 334
Mg " 40
Na " 302

K Bromophate 210

Borate
CaB$_6$O10 450
NaBorate anhy 561

Malleable Nickel from Journal Chem Society of London - 1880 pg. 930

By J. Garnier (Compt. rend 90, 331-333)

By adding to pure nickel, which after fusion is brittle, some substances which will readily combine with the oxygen absorbed by the molten metal whilst cooling, and which will diffuse through the whole mass, it may be made perfectly malleable. Phosphorus is best adapted for this purpose, 0.3 percent being sufficient to render the nickel soft and malleable; a greater quantity of phosphorus makes the metal harder & less malleable. The phosphorus is added in the form of phosphide of nickel, containing about 16 per cent of phosphorus. It is prepared by fusing a mixture of calcium phosphate, silica, charcoal and nickel. Nickel containing 0.25 per cent of phosphorus may easily be rolled into leaves 0.5 mm. thick.

L. T. O'S.

F K D

Winkler on nickel - Journ. Chemical Soc of London
1880 pg. 771.

Winkler describes the preparation of large castings of nickel and cobalt and of ductile nickel. He succeeded in obtaining the latter by removing carbon & silicon from nickel by means of fusion with oxide of nickel. The metal shows a tendency to become crystalline.

Preparation of malleable nickel and cobalt, and the application of these metals in the fine state - Journ. of Chemical Soc. of London -
1879 - pg. 563.

By - T. Fleitman (Deut. chem. Ges. Ber. 12, 454-455)

If magnesium in the proportion of one-eighth per cent is added to nickel & cobalt, it becomes malleable and ductile and susceptible of a high polish. The alloys do not alter in the air and are well fitted for making hammers &c. They can also be molded to iron and steel at a white heat, & rolled into thin plates without separating from these metals. The same results should not be obtained with manganese, aluminium, calcium

&C. The addition of a minute quantity of magnesium to some other metals e.g. steel, causes a great alteration in structure. Whether the magnesium acts by destroying carbonic oxide, or from its great affinity for nitrogen by breaking up some compounds, such as cyanogen, the author leaves undetermined. The modus operandi is to drop the magnesium through a hole in the cover of the crucible, having previously introduced a few pieces of charcoal to remove oxygen - E.F.A.

Silicon - Journ. Chem. Society of London - 1889 - April 15

By - H. N. Warren - (Chem. News 57, 54)

The following is a new method of preparing silicon. Small bars of silicon-iron are suspended in dilute sulphuric acid from the positive pole of a battery of two Bunsen chloride cells and are kept in contact with a platinum plate forming the negative pole. The iron dissolves and leaves a residue of graphite, silica, and amorphous silicon, which is treated

to redness in a stream of carbonic anhydride, and then to a full red heat in a closed iron tube with some zinc; the zinc button obtained in this manner is dissolved in hydrochloric acid, when crystalline silicon remains undissolved; by heating the amorphous silicon at a full white heat with aluminium instead of zinc, graphitoidal silicon is obtained. When an alloy of aluminium and silver is heated to low intense white heat with potassium silicofluoride small quantities of silicon are produced in the form of a bright reddish brown powder.

Passivity of iron, nickel — J. of Chem. Soc. of London 1888 pg. 788

By E. Saint-Edme (Compt. rend. 106, 1079-1080)

Commercial shot nickel is passive in ordinary nitric acid whereas iron is only passive in fuming acid, but iron in contact with nickel becomes passive in the ordinary acid. Iron becomes passive gradually but nickel is passive immediately. If iron & nickel are intro-

duced into the acid together the iron likewise becomes passive instantly. Electrolytic nickel from an ammoniacal solution of the chloride or sulphate is passive immediately. Iron is only passive when agitated and loses its passivity if heated in hydrogen. Passive nickel when heated to a bright redness in a current of pure hydrogen yields a small quantity of ammonia and acquires a silvery lustre but remains passive, and when it would seem that the nickel retains some of the nitrogen very tenaciously. C.H.B.

Nickel ammonium Oxalate - J. of Chem. Soc. London 1888 - pg. 788

Ref. K. Kraut (Annalen, 245, 239, 240)

Nickel oxalate dissolves in ammonia and the solution deposits green microscopic crystals of the composition $2NH_3$, $NiC_2O_4 + 5H_2O$. The compound effloresces on exposure to the air and loses three mols. of H_2O.

Passivity of Cobalt- J. of Chem. Soc. London. 1889 vp/1114.

By E. Saint-Edme (Compt. rend. 109, 304-305)

Pure cobalt is instantly attacked by concentrated nitric acid and if the metal is withdrawn, exposed to the air and again immersed the action is as vigorous as before. Contact with steel or nickel does not, as in the case of iron, arrest the action of the acids. Cobalt is however not attacked by dilute nitric acid in the cold.

Electrolytic cobalt, unlike electrolytic iron or nickel, does not contain nitrogen and yields no ammonia when heated in pure hydrogen. After being heated in pure nitrogen for a long time at a bright red heat cobalt is somewhat less rapidly attacked by nitric acid a fact which points to the possible existence of passive nitrides of cobalt similar to the passive nitrides of nickel & iron. The passivity of the three metals follows the order of their affinities for nitrogen which is, nickel, iron, cobalt. C.H.B.

J. Chem Soc. London.
1877-pg 82-

I am indebted to Dr. Russell for the nickel and cobalt used in these experiments. They were portions of the pure metals prepared for his research on the atomic weights of these elements (this journal XVI 5-13; XVII, 294). The nickel was in the form of hard, dull grey cubic lumps. On analysing the gaseous mixture evolved on dissolving it in nitric acid, it was found to contain hydrogen, of which 1.47 c.c. was obtained in Expt. I, and 2.28 c.c. in Expt. II, or 6.25 c.c. and 6.17 c.c. respectively from 100 grams of nickel. In the course of this investigation the production of hydrogen has never been observed on dissolving metals in 1:2 acid, or indeed in nitric acid of any strength, and as moreover no hydrogen was obtained on dissolving fused commercial nickel (Expt. III), there can be no doubt that the hydrogen had been occluded by the metal during its preparation from the oxide by

reduction in hydrogen. This fact that occluded hydrogen is without action on nitric acid is, however, of very considerable interest, as it may be possible by the action of nitric acid to ascertain whether, & how much, segregated, a portion of the hydrogen occluded by palladium is combined with the metal. I also propose to apply the method to the study of the gases in meteorites, and it may here be remarked that this discovery of the power of nickel to occlude a very considerable volume of hydrogen explains the occurrence of such large amounts of this gas in meteorites which previously on account of the slight power of occluding hydrogen which iron alone appeared to possess, was somewhat difficult of explanation.

No hydrogen was obtained from the cobalt, although it had also been prepared from the oxide by reduction in hydrogen. Both the pieces dissolved was the only one

in the bottle from which it was taken presenting a metallic appearance. The remainder of the specimen had assumed a brown friable condition, having evidently undergone oxidation. I am inclined to believe from this that the cobalt had originally been charged with hydrogen, with the exception of the piece used by us, which was extremely dense and compact. The spontaneous oxidation of metals prepared by reduction from hydrogen is, in fact very probably always due to the presence of occluded hydrogen —

H. E. A.

J. Chem. Soc. of London
1890 II pg. 563

Nickel oxide dissolved in potassium metarsenate to the extent of 8 percent yields the compound $12NiO, 3K_2O, 5As_2O_5$ in prisms, which are probably rhombic. With a higher proportion of nickel, the product $2NiO, K_2O, As_2O_5$ is obtained at the same time, and in presence of potassium chloride it is the only product; it crystallises in large, pale yellow, micaceous lamellae which decrepitate slightly. Sodium metarsenate yields green, transparent, monoclinic prisms of the pyro-arsenate, $4NiO, 2Na_2O, 3As_2O_5$. In presence of sodium chloride, the compound $12NiO, Na_2O, As_2O_5$ is also obtained; the latter is the sole product when sodium pyro-arsenate or ortho-arsenate is used; it crystallises in green lamellae derived from a hexagonal prism.

Cobalt oxide in small quantity in potassium metarsenate is converted

into violet mamillary crystals of the compound $2\,CoO, As_2O_5$, while act on polarized light. With more cobalt oxide, the product $2\,CoO, K_2O, As_2O_5$ is obtained in slightly opaque, blue prisms with long tubular [illegible]. This compound is the sole product in presence of potassium chloride. Sodium thiarsenate yields the compound $4\,CoO, 2\,Na_2O, 3As_2O_5$ in violet, strongly marked lamellae, isomorphous with the corresponding compound of nickel. In presence of sodium chloride the compound $CoO, 2\,Na_2O, As_2O_5$ is also formed, and it is the only product when sodium ortho arsenate or pyro-arsenate is used; it forms blue, transparent crystals, isomorphous with those of the corresponding manganese and cadmium compounds.

Cobaltous Sebate Journ. Chem. Soc.
$\{Co.C_{10}H_{16}O_4\}$ 2nd Series Vol. XIII pg. 309

Cobaltous sebate may formed by dissolving freshly precipitated cobaltous hydrate in aqueous sebacic acid with the aid of heat; Evaporating the solution to dryness; and after digestion with boiling alcohol, Drying at 100°. When thus prepared, it is obtained in rich purple-blue thin scales, anhydrous, and sparingly soluble in cold, somewhat more freely in hot water, and forming a rose red solution. By cautious Evaporation it may be obtained in thin red scales, containing water of crystallization, but always mixed with a small quantity of the blue scales. Solutions of cobalt salts are not precipitated either by sebacic acid or by soluble sebates.

220

FRANK LOVER

March 10th 1905 -

By precipitating Ni + Co Sulphate together in various proportions with NaOH, boiling + washing we get a mixed hydroxide of the 2 metals, These are dried and powdered + pressed into a Cake with little damp with NH4 Then the cake is reduced by Hydrogen + then above a welding heat almost to melting point Then rolled out + made into flake — also the powder can be sized + reduced as powder in Quartz, Then Separated by Magnet + packed ready for use to flake — the addition of the Co to the Ni makes the flake give good contact

This is an alloy + yet is not an alloy it is a

Mich 10 1905

Very peculiar metal ~~[illegible]~~ Each particle of Co + Ni are separate phys. alloy, not molecularly as of the compound ~~[illegible]~~ molecule Hence either metal can act alone as a metal as Co is oxided in + goes to a peroxide in KOH & Current + Ni does not, the Ni serves as a frame to prevent the Co from disintegrating ~~[illegible]~~ resumes Conformity of Control in the Cadmium Electrode ~~[illegible]~~ Co + the green by Presence of Ni

This idea ~~[redacted]~~ applying dies for ~~[illegible]~~ purposes

Mech. 1.01.905

970

Mixed oxides or hydroxides of Iron & Nickel 40 Ni 60 Fe are reduced by H from above welding heat. Then the Cake or powder is used — the battery the nut being nickel-clad Electrolytically leaving the Ni to act as a frame work preventing disintegration also acting as a Catalyst possibly a little Co & all should be added to ensure Ni making Carbon Thus the Mercury will not be essential —

Again with Ni + Iron mixture of a Cake, 50 Ni 50 Fe the Iron can be plated out Electrolytically or by acids leaving the Cake of Ni metal + porous there. The Ni spongy pebble

March 10 1905

is acted on by NaOH free NaOH by Cement & Ni_2O_3 hydrox formed within the spray of the M & Fe wet method the iron could not be eaten out without decomposition -

The whole compound is novel a metal within a metal. There are probably many things this doubled developed proposition could be applied to besides Battery purposes

Yrs

March 10 1905

9 & 10

RANK OVER

Agood way of [illegible]

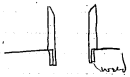
Pos plates of N_2O_3 H_2 or NO_2 gas
is to charge in 33% Mats
Charge - remove from KOH +
dry with KOH & then
Recharge at a higher
pressure - 1st Cor 75 ohms
finally at 200 ohms -
The final reacts is
products which must
swell so much +
do not thereafter swell
to same extent as originally

for making up any thin
flake - plates sheets of
new metal Ni + Co in
right proportions by
regulated amperage
Effect anodes of the 2
metals - then dissolve
in Hydrogen - then
Cast in squares 1/8 a
roll in oil - after

Mch 10 1905

Eat iron not by weak or
Current thus lessen the
flow by thin + double
Covering power

Mch 16 1905



John Ott makes model filler
square top coil also Edelmann
Cups to Electric weld makes
Socket

Dec about Cobalt plated
Cups - 2

Dec Webber about battery
posts, drop forged Ele
Warren make 60 Cobalt
40 Nickel by using
Ni plated + Co plated
Shells 20/1000 thick

March 16 1905

9X0

Naphthionate MP 908C
Sulphanilate K 861
" Na 865
Carb K 834
" Na 814

Ni 1200 to 1400 C
Powdered from scale Nitro 30 on 60
Mixed with Ni Co 60/40 Coke
heated yellow white — Hydrogen
& nox Salen out —

Photo Lumo get some Alpha Naphth
powder 30 on 60 Cover with
Coke Co/Ni press 150 almost
Cont Then soak out nuclear
Red Col 200 Run to Weed
heat — HF dissolves out
Lumo with dilute HCl.
also fuse pp photo Lumo —
Fr. Carlton

See Lewis about graphited
Cell cup —

March 16 1905

MgO moist with Carb K water press + dry Screen 30 on 60 Coat with Co/Ni flake with Mol + K_2CO_3 + H2O wash out Mol + K_2CO_3 + H2O with, also out MgO by pot Sulphume

£20

See if Carb Mag Magnesia Contracts on heating to what if Contract it;

Ralph make Iron by H, then pass N in Hyd to see if N absorbed Rdg dope + Excel,

Speak Jowa about danger NH_3 falling in row from by H, Use buffer

Trimagnesic phosphate Ortho or neutral Salts is easily removed after ignition needed Obs added Even after Ca Chloride heat better than Phos Ca Very high MP Tinsley pp 7:10 2. P + Mg_3P_2

March 16 1905

Phlogopite Mica melts higher than red-Easily Calcined

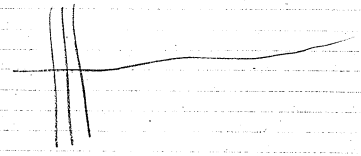
Trisodic orthophos does not melt at strong red heat.

Put 1 gram .0001 flake Co/Mg in Cupel Smooth press 25 atmos cooled H.
also 1 gram with .0003 —

Wet MgO with Boracic acid
ignite white heat $MgNO_3$
$MgSO_4$ Mg Acetate,

Quartz quartz Crystalized
flake Ni flake hydroxide
Silicic oxide with Mg Co
flake —

Mg Ba OH in Sol $MgSO_4$ 1/10 N
to get out SO_4 + 1% Phenol
dipping Sol



March 16 1905

get Thaso Amine bases + test dissolving Ni(OH)2 for Ni(OH)2 + Hexose only Trioxymethylenamine — dissolves it —

Try also Ni(OH)2 Hydrazine, also Ni(OH)3 " " in NH4Cl

Disposed to the plating of graphite with Ni Co alloy Imbedded Ni only

See Claims of Cook Chas to Co alloy & Co alone

Mention Sublimed Chloride Scales tri-acid K4 Reduced by H also Co & Double chloride

March 16 1905

Put in about 2 grms Cobalt flakes (Grant) make 3 grds put in 21% with Ry Chg density weigh accurately put in long test

Alloys with Ni flake –
Mn Pb Ag Mo W Cr Ur
Cu Sb Co Mg Bi –

Volatilize by sublimation a mix of 60 Chl Co 40 Chl Ni + reduce in sublimation the flakes are alloys

Making of Cake by rolling
Already to to grade.
Nitrides of Co + Ni in proportion to give 60% Co 40 Ni Reduce – Hot roll

RECEIVED
1905

March 16 1905

Rec'd

Dec of Paracyanogen
Conductor mfg Z

from oxalates of Uranium
Ur is deposited as a
hydrated Oxide —

Alloy Co also Ni with
Tellurium for flake
judging from reading T2 worked
I worked with Ni

When get 60 Co 40 Ni flake
have groups run on 5 8
12 21 & 33% KOH & NaOH —
use Reg grade NaOH
Nate Buell

Sponge cups dip in Conc
$NiCl_2$ decahydrate & dip
till nearly full — then
soak in KOH & boil —

March 16 1907

Co Ur Cattle corrosion prevent
deep impress of electrolytic
action + but doubt deposits
from an Ursinate -

$CoSb_2 - NaOH$

Co + Mg
Co + Cr
Co + Zr
Co + Te -

FKD

I find that with 10 Ni + 10 Iron
that in 21% it is not alloy
acceptable + even 15 % is
Ni keeps bright - I am going
to roll out some sheets
+ test as cups for bat
with 5 Co. 5 Ni + 10 Iron Ursinate
Contacts 6 volts OK + but Co will
be too expensive some small
% Co must must plate
proceed with

March 21 1905

grid like lead battery grid open both faces made of one grid blank sides drawn in die — Then apertures filled with flake & laid on flat porcelain blank with slab on top & ~~[illegible]~~ cooked in the charge of pores after which filled by dipping process — next grid this shape seems so far ok — don't come out

Always

Yours

FRANK L. DYER
MAR 1905
ORANGE N.J.

Mch 21 1905

Tried 8975 today reduced
in H. it swelled to 128 in
centre this makes it 149 but
The welding is OK on
dissolving the HgO in Dilute
Hy SO4 shows fine cellular
walled structure Except
where disrupted by
swelling — Does would
answer but think later
Soda + higher heat in HgO
better — We try Tomorrow
Strongly ignited Tricalcicphosphate
it dissolves but white heat
+ after is very soft in dilute
acids not attacked Metal
part = only trace as formation
of phosphide

FRANK L. DYER
1908
ORANGE N.J.

220

March 22 1905

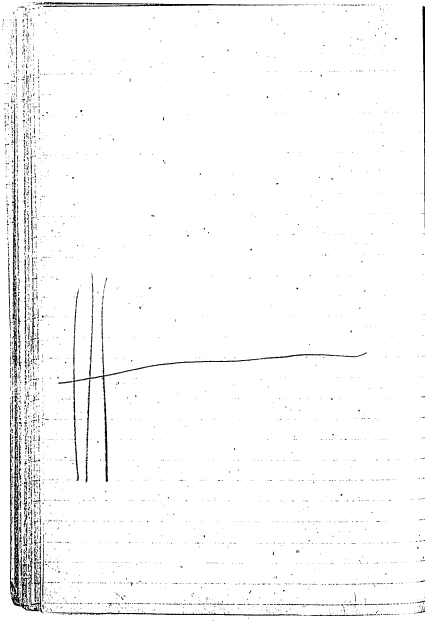
We are making some cells today by opening one end of the cups inserting a blank that is longer than the cups & pressing — Crimping the cups in usual way then withdrawing blank leaving a complete cup prepared on sides & one end & powdered the cups with flake Cobalt Nitro 20 acids Nitro 40 both require about 650 mlg Then ends are closed & cups inserted in grid — ready to be welded in Hydrogen Then to be filled with NiO_2 by successive dipping — drying — I find the jarring way of filling is O.K. & then I have it ready to check filling — The cups & tubes should be made .005 larger & after filling pressed to gether .005 thus putting a tension on the flakes

March 22 1905

against the cup it will
require a little more crumb to
flake or a little more flake

April 10 1905 SBB

We have trouble in getting the Nickel plating to form perforated tubes on account of cracking when it gets thick = We first plate on the Nickel 1/4 minutes the tubes are treated with Chalcar Sulphate & Co with Zinc at low density then in slightly alkaline Ammon Sulfate Nickel bath but are troubled with the Ni cracking when it gets thick enough Have tried Double Ni ammon Chloride also Double Ammon Ni Oxalate & various deviations however we will have to omit the perforations use type metal moulds melt it out & clean with acid & perforate by rotating on a mandrel



smaller than the bore
& grooved as a female
with undercuts a Semilar
to what we know use
May have to use a wire with No ends
Iron mouse & draw down
Eating out Iron by acid &
then perforating -

April 12 after a vast amount
of N plating Tools have now
got one trial gross hope of
doing something, on the
theory that the Cracking
of the nickel plus Wire
due to tensin produced by
hydrogen & put H_2O_2
in Solution to combine with
the H. it works & I am Enabled
to get it Clear with Cracking & with the Knurled
Mr Rod with holes filled
with tar & Emery & Carbo
but taking attempt to

Apl 12 1905

Eat out the Zinc like H gas
Crack the Ni to plate
over it — can grow
to take it out by plating
it out — 21% KOH Solution
to get rid of the H
also to obtain best Ni
Solution + H_2O_2 = Precipitate
obtain, traces or Ammoniacal
ammonia H_2O_2 =
Also plated two tubes
made by Chilling one —
Record for plating + after
plating — Chilled tube
went 20 below Zero F Thermometer
or thermometer —
Thumbs and rubber mandrel
Can be chilled out of
plated Cubes —
Quenching Cadmium instead
Zinc —
Tried making tubes of Ray
Jeff Stock but around mandrel
Wrapped + Rolled + then
plated together + would
Not stretch enough to get

april 12 1905

flaked stucks to work
also flaked wards a
way tube but it cracks
here also -

-

April 26 1905

Do not so clear Envy to cover
the grain Sept 2 x 4 inches
flake Co, with the ratio of
1/4 in. thro 20 on 180, it won't
covered with 8 in - 3 flake 1 inches
neither with 2 inch cover —
The flakes go together like this
they do not go around
the pail each, Envelope
the trick is a thinner
flake that will go
they be - that used is
between .0002 & 0003
about to cover well it
must be between .0001 & .0015

apl 20 1905 SB

I am trying other sticky stuff
Flypaper stuff Trimmed by
Blanzac to right consistency
after mixing Cut to get a coil
for elevator stick in elevators
Cg of the surfaces

Weight of tube 3.25 long - 1,460 -

Material Reg Nemix pkd hard
wasted in 4.300,

1/2 inch waste both ends
net 2.75" length actual material

Reg balloon tube net length
3.75 - which gives 5.861 grms
per tube Reg mix -
argument 9.21 in E 18 -
& 82% of that in E 18 in new
6 plates -

Apl 20 1905

with 4 grzzw Ihno 20 on 180 —
1.75 flake Ca .0001 @ .00015 —
1 qrm Molasses - not perfectly dry
Hy that Molasses Evap 1/2

Ic wors 4 grzzw 1.75 flak 50c Mlq
Molasses Ic wors
92% of Ni + Fe-Ko -
30.48% flake 69.57 Ni -
after Metal taken out.

or with allow 64 1/2 Ni 8% Iron
28% flake —

Weight okd 4330. qrms
277 Nickel hydrox
1,212 flake -
346 Mlq Molasses qrmsed at -5
The grid is Ko plated
This gives as compared with Req
mix 80% of Ni to 100% Req mix —
with longer tubes + vacuum of tubes +
less Molasses obly get 83%
of what Can get in tubes with
Req mix

Edison tube cell — No. 1

4 gram screw
1.750. Coffake, .0001 to .0015
1 McCarroll —
Tube packed .002 Co Ni, alloy
70% Co 30 Ni —
Thumped hard — not Compact
Soaked all night 1½% KOH,
Charged once —
Callipers 276 — Run 21%

Weight after charge 4.350.

Leaves 3.707 volume free of
McCarroll
or 69.57% in OH

or 2.1578 in pores / pores 2.690 gm-gms

Drying shows McCarroll loss
only 28 to 30% since 2.690 correct

Cape 21 1905

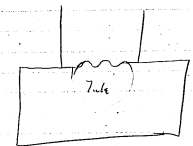
Cylinder 1 dia 2 long 1 dip
10001- produces 10 grammes -
Double section 20 cylinders. 1 dip
200 grammes, 40 dips in 20 hours
8000 grammes or about 18 pounds
for 2 men -
4 pole sections wanted for 125 Lbs.
Daily - 14 men -
2450 - 2 pounds 10 oz
4 Laborers 7 oz - Highlow gear
2 men
Total
44.50

35.6 Cents Lb for Labor -

20 ft each double section - in row 210
Double row 105 ft

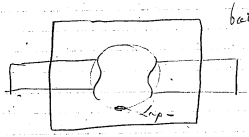
Probably bldg 40 wide 150 long

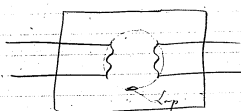
April 23 1905 SB



one side Corrugating

both sides





April 23. 1905

Effect of Formaldehyde and of Zinc Sulphate
Co. on Co Nu Culture
[illegible] being taken over by
[illegible] to blowers (Chain
Zinc butterfly pinner-chain)

Designing Complete outfit
for 125 Kbo of .0001 Co Nu
Culture Daily — Travelling
Crane — Two sets of
20 Revolving Drums 1x2 m
Each 1 meter Cross Section

Required 4 sets of Rubber
Belting 150 X 40 —

Am trying Ventilating from
Chloroform to Sphagnum
then Reduce by [illegible]
then Reduce Co Nu
by the new the new
[illegible] with solution

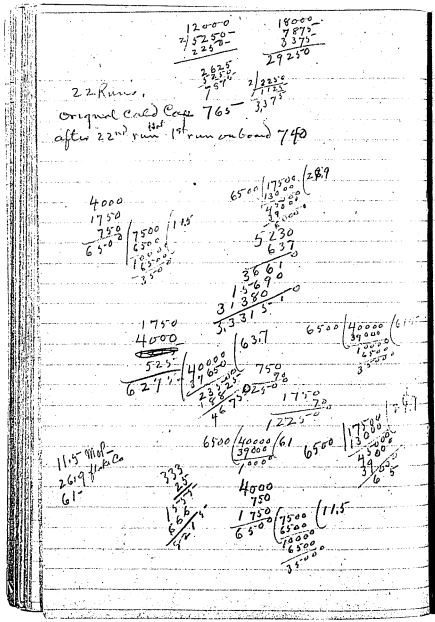
apl 23 1905

think can make it go -

E no 1 tube 1st run 425 to V

2nd 563 3rd 568 -

This shows that a large amount of active material is still found of Contact & that the tube must be subjected to great pressure with a Corrugated die to pack the particles closer & increase area of Contact between green & green No 1 & 2 & also between green & flake Co No showed have given 852 to V or 284 lost by bad Contacts,

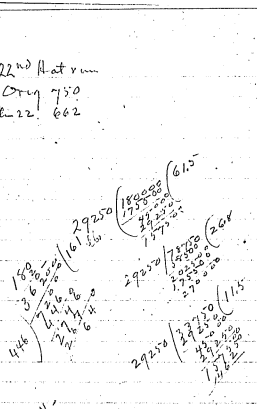


Apl 25 1905 30% of flake

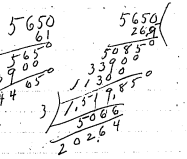
Edison tube No 2

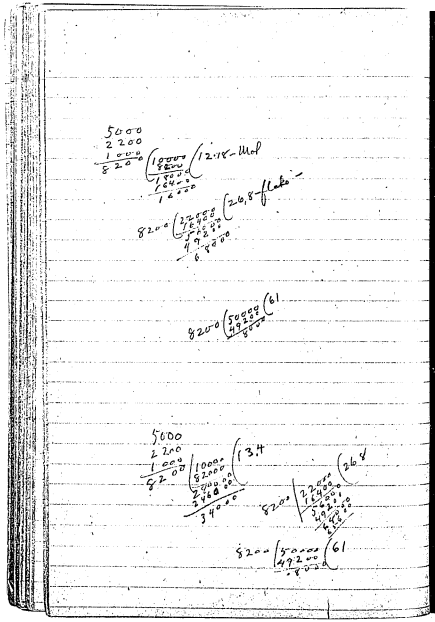
4 grams $Ni(OH)_2$ thro 20 on 180
1.750 - of Co flake through
30 mesh — 0001 but its Coarser & short cover perfect
750 mil g Malaccas —
Not well covered.
Co Ni alloy plated Tube - welded — H
but tube top joint not welded —
packed in sections & lead hammer
put in one side Corrugation
Dia 150 ottmans Soaked
1½ KOH, got Malacca out
Ends rounded in Freddys new
die, Run Reg in 21% —
Weight of active Material —
3.33 mg 5.1230 — Corry 125 ohms Caliper 262 on Corry 7413
4350 with leaves 4796 - with
Malacca 1, or 3.357 $Ni(OH)_2$ —
Charged que on 2nd Run 7.17 to Volts

22nd Autumn
Orig 750
after 22! 662



Edison tube No 3
Same as No 2 except
No green Illno 20 on 40 —
it is however covered in little letters,
wt ochre material 5650
Cal on Corr side 260
Press 125 atmos
Rule Reg 21/0





Edison Tube No 4

5 grazn 20 on 40 -

2.200 Mg. flaka Ni 0001 -
Very thin probably ovals
0001 ± Enormous
Covering Rowan. Much
less wilted cinnamon
1 Malaccas
Run Reg 21%
Corrug 125 almos
Calleys on Corrugtns 253
Wright Obsolete Material 5.155 -

3.24 grazn
2
6.48

22 Hafnium
Orig 390 =
22nd 475

5000
2625
1000
8625 | 10000 (11.5
8625
13750
12937.50
812.50
57

8625 | 26250 (3.04
25875
375.0
57.9

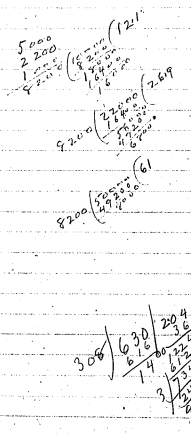
8625 | 50000 (5.79
43125
6875.0
5750.0
1125.0
857

Iron flake -
Edum Tube NO5

5 green 20 on 40
2.625 flake 70% 72
30% Cobalt
1 Molasses Covers only
fair - made Cy
Warm plate
Corning 125 almost
Caliper on Corning 255
Wright Active Material 5.355

11.5 mof 20 on 40 Cor
30.1 flake -
57.9 green
99.4

2.2 m² Kat leaf
orng 465–
2 m² hr 298



Edison Tube No 6

5 green 20 on 40

2.200 flake 60 Co 40 Ni
negat rolled + cut
in slivers - dont cover
well — 0002
dont bend around & when
dry slivers come off
Run Req 1. grm maximum

Run Req 21%

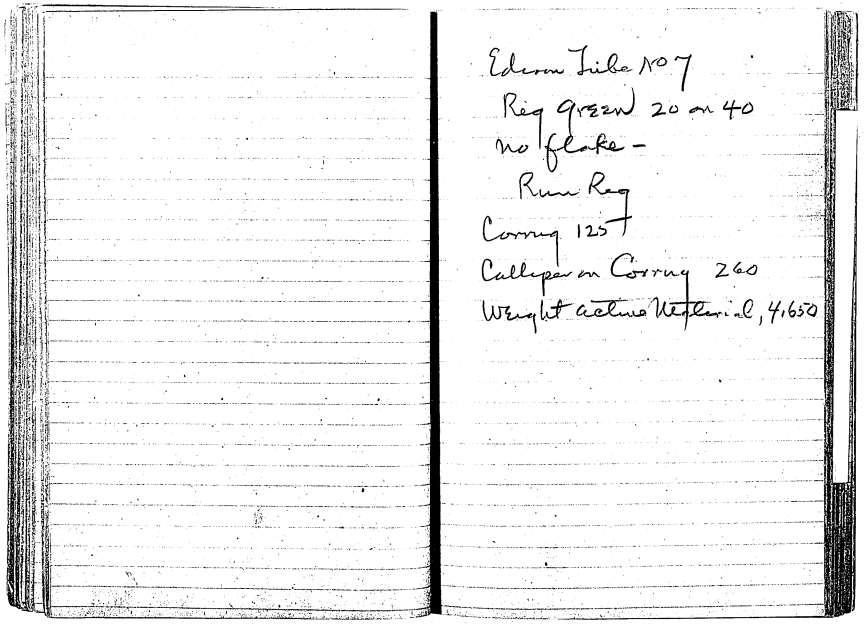
Corrug 125 alum

Caliper on Corrug 250

Wright Actual Material 4.895

3.08 net.

12.1 i Mat 20 on 40 Cut Rolled Sliver –
2.619 flake Co 60/40
61.8 green
19.0


Eden on Tube No 7
Reg grazed 20 on 40
no flake -
Run Reg
Corning 125
Caliper on Corning 260
Weight actual Nephelometrical, 4,650

22nd Hot Leak
orig 730
22nd rim 942 5

5000 / 2200 / 800) 62.5
8000) 27.5
8000) 10000

5000 / 2200 / 7200 / 7 / 5041

5000 / 2200 / 800) 8000

Edison tube No 8

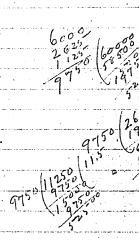
5 gram 20 on 40
2.200 flake Cobalt 60%
Ni 40%. Electroplated
by Warren 0002 —
poor covering power
800 mfg Washington.

Corning 125 calm
Caliper .256
Weight calm Washington
5.440-

3.149-green

62.5
27.5
10

22nd Heat Cast
Orig 660
22nd rem 610



Edison #09 Tube –

6 grs new lino 20 on 40

21625 flake from Hydrol Co + Mi 70 x 30 Ni –
Rolled –
1.125 Mal –
Flake too thick cast covers handily any – Had
wreckage with tube –
broke head reproveder –
probably ng –

Weight active Mal 5325 –
Cal 266
almos Cor 125 –

339 ALREADY grams

Chrom 615 –
Flake 2619
Mica – .1115

May 4th 1903

flake Co Sulphide

3 Co_2O_3 — 3 Sulphur = Excess of Mono Sulf K — large Cry of coarse ak — considerable black

3 Co_2O_3 4 Sulphur Excess KS — ng no crystals

3 Co_2O_3 2 Sulphur KS — Excess Think it as good if not better than 3 Sulphur = better yield + Crystal

KS alone ng — no Crystals —

KS + KOH, no S 3 grm Co_2O_3 ng —

Have just (unmolded) a Crucible 60 grms Co_2O_3 40 grms Sulfur 2 lbs KSulfide Think it going to be good — it shrunk 60 to 65% in bulk after Cooling

May 4 1905

If from the larger Crystals are too thick may have to cool quicker or screen out & unscreen the largest & return to pot

They roast OK. + easily will make beautiful flake when reduced

The trick is to keep heat up till the K.S. shrinks then increase heat till it is liquid or nearly so = The K.S. melts at low temp. boils violently ~~but the heat~~ heat is very liquid (mobile) as the heat of fusion is ~~of~~ Contracts & thickens at very time — when fully Contracted raise heat to get it liquid or nearly liquid again — then cool slowly for large Crystals = Possibly the heat must continue for some time to get best yield Am trying this

May 4 1905

Am now running a 70 Co + 30 Ni from the Oxides to see if they go together or Crystal separate.

1.500 Oxide Copper
1.500 Cobalt OX
2.000 Sulfur

Large yield - plates, macled
Crys - dark reds, no color but
this may be due to much Cu in
the batch - OR myrowax
Thinness Reg

1.500 Oxide Bismuth
1.500 " Cobalt
2.000 Sulfur
Brilliant smade Crystal Octagon
very little muck ground
yield - Crystals fair some thick
balance Reg thickness -
.9000 + - Silvery light Color
[illegible]

May 4 1905

2 grms Oxide Cobalt
1 " Iron Ox
2 Sulfur -

Yield fair - plates not adequate but various largest crystals of fair acetic dia / some fr Gibbsite from muck & thick, dark blowing crystals.

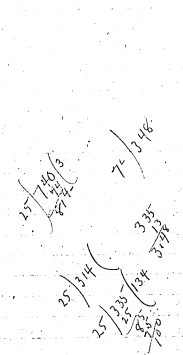
2 grms Ox Cobalt
1 " Cadmium
2 Sulfur

Yield not so good - plates. Req - Comm. Cad Cl Ox in / as muck -

May 4 1909

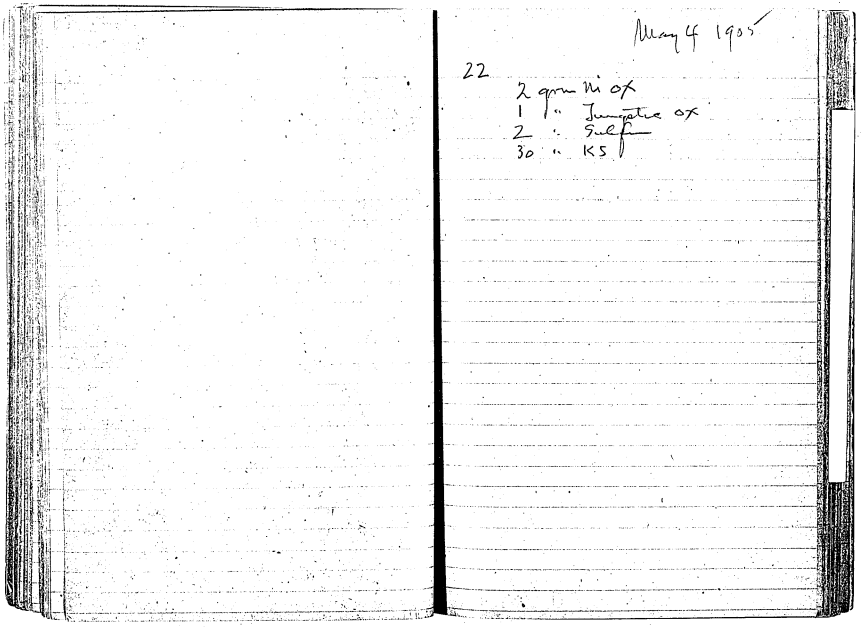
No 20 -

2 grm Nickel ox
1 " Chromium ox
2 " Sulfur -
Bo - KS



May 4 1905.

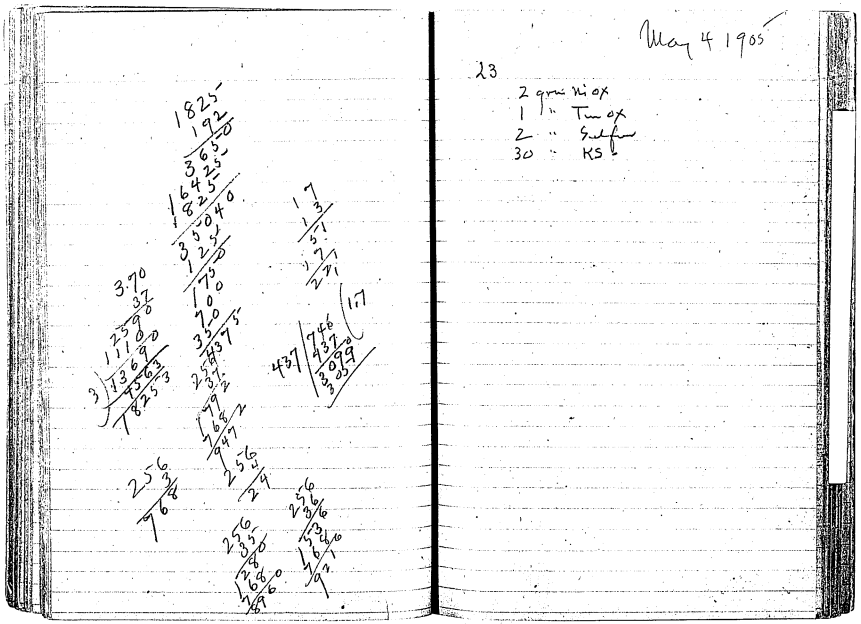
21 -
2 grms NiOx
1 " MnO2Ca Ox
2 " Sulfur
30 " KS



May 4 1905

22

2 grm ni ox
1 " Tungstic ox
2 " Sulf
30 " KS



May 4 1905

23

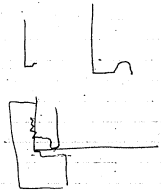
2 grms Ni ox
1 " Tin ox
2 " Sulfur
30 " KS

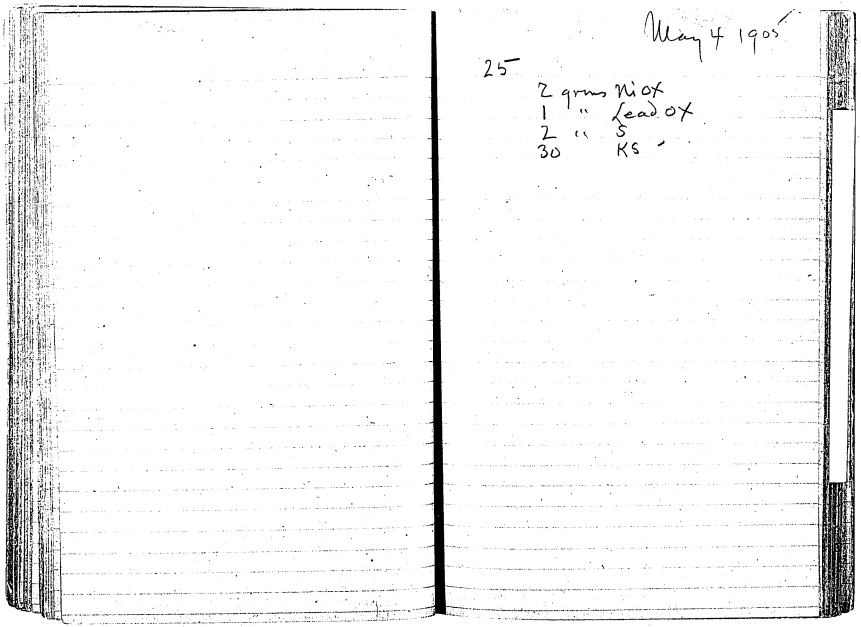
May 4 1905

24

2 gms Ni ox
1 " Cu ox
2 " S
30 " KS

Broke —
Duplicated it —

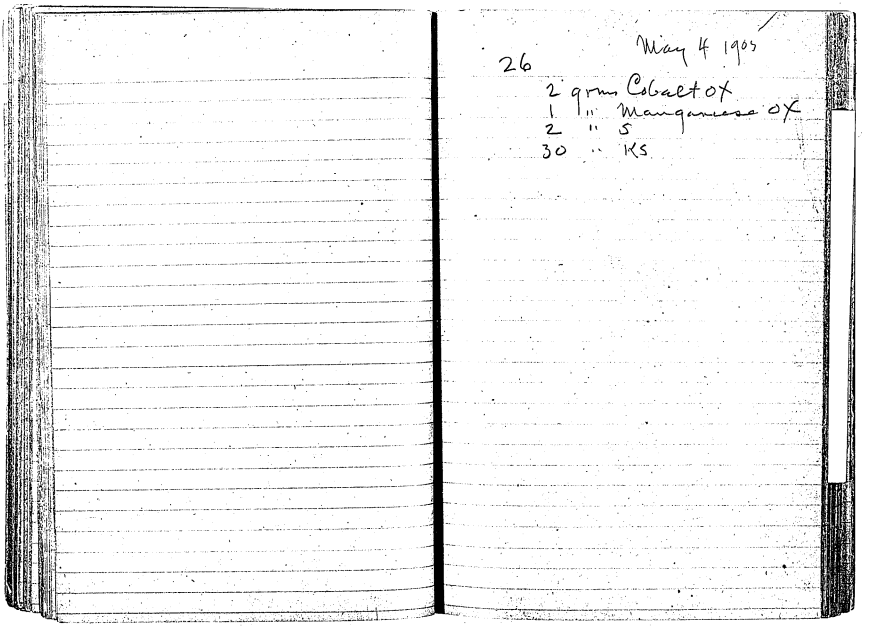




May 4 1905

25

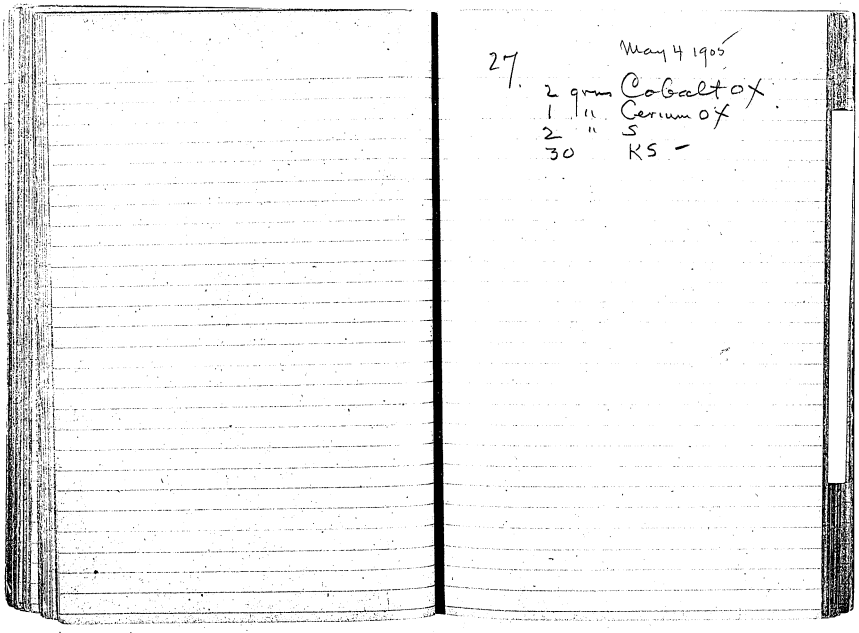
2 grms NiOx
1 " Lead Ox
2 " S
30 " KS



May 4 1905

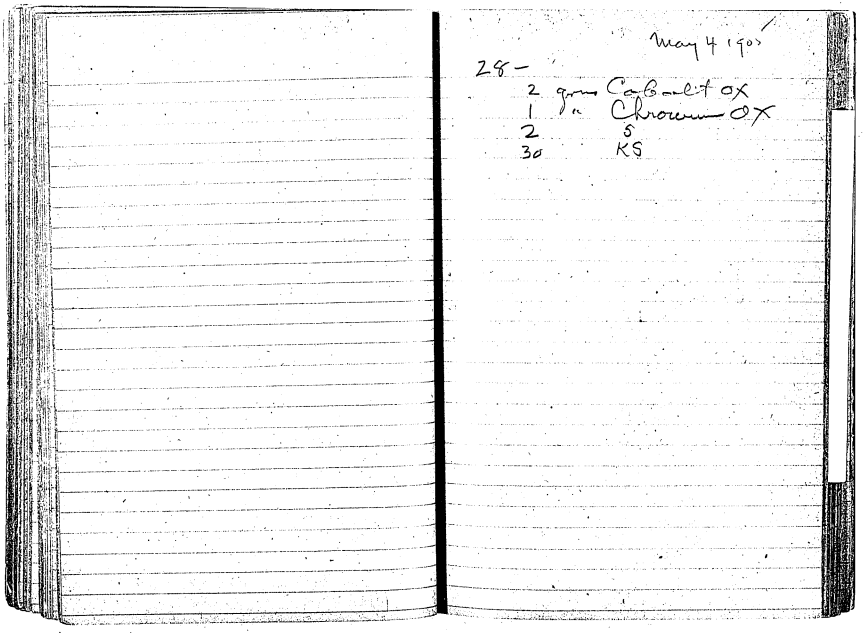
26

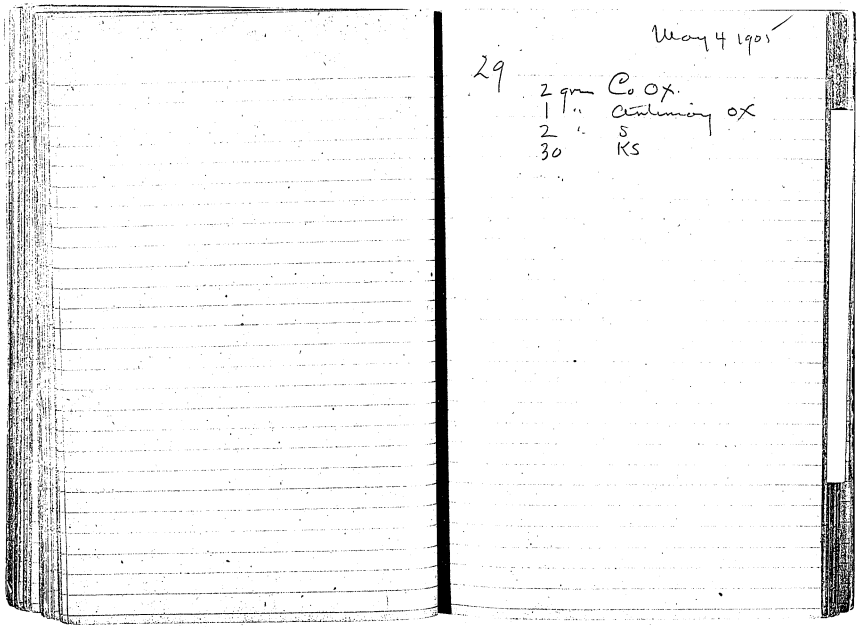
2 grm Cobalt ox
1 " Manganese ox
2 " S
30 " KS


27.

May 4 1905

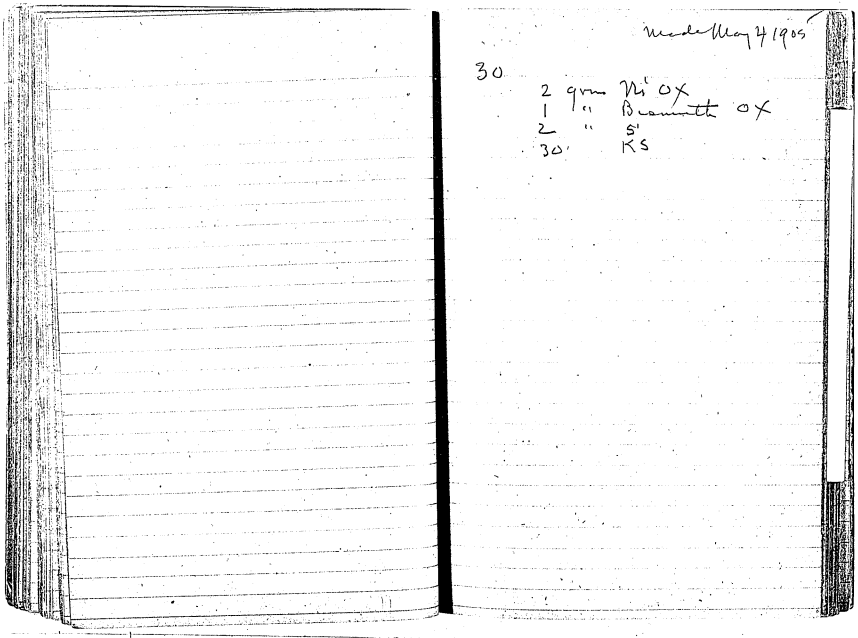
2 grm Cobalt ox.
1 " Cerium ox
2 " S
30 " KS —


May 4 1903
28-
2 gms Cobalt ox
1 " Chromium ox
2 5
30 KS


May 4 1901

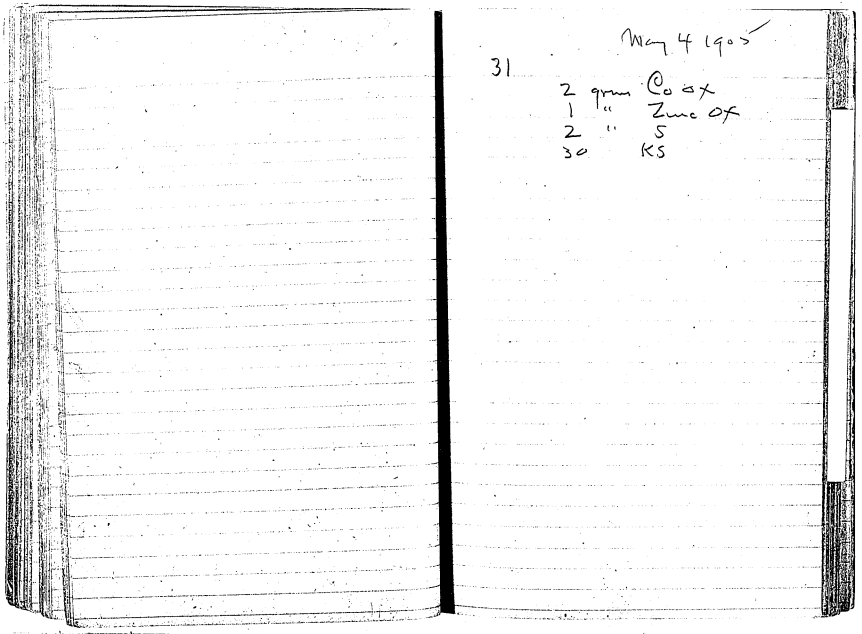
29

2 gm Co Ox.
1 " aluminum ox
2 " S
30 KS


made May 4 1905

30

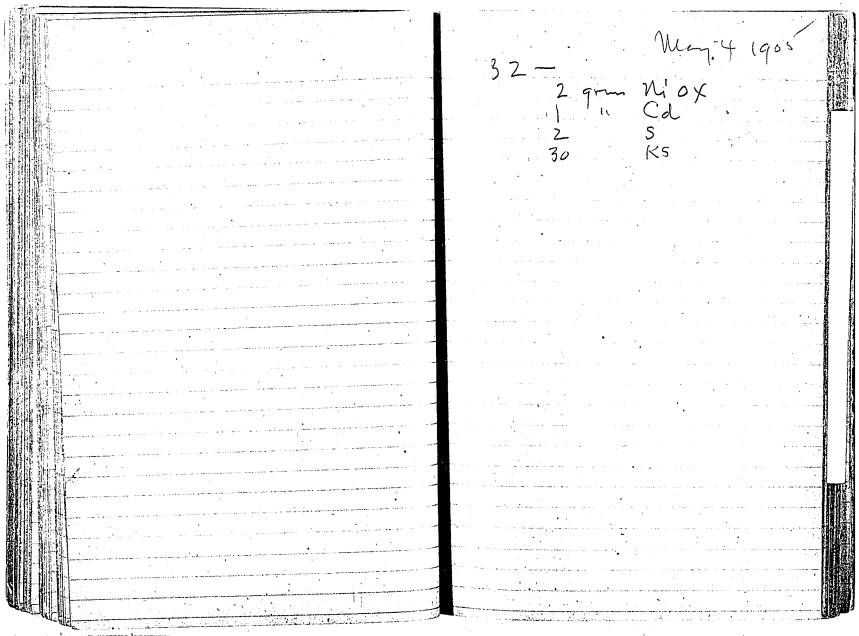
2 gms Ni OX
1 " Bismuth OX
2 " Si
30 KS



May 4 1903

31

2 gms Co ox
1 " Zinc ox
2 " S
30 KS



May 4 1905

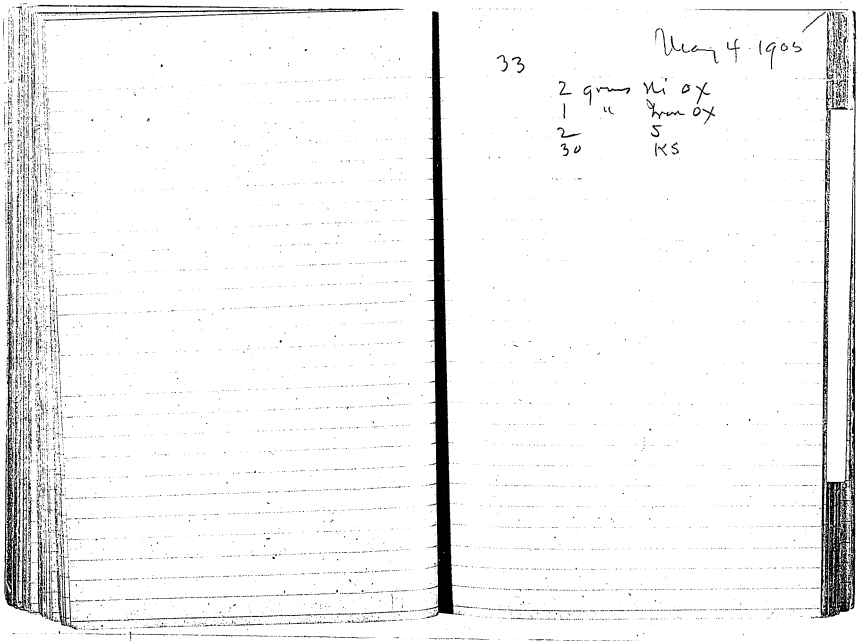
32 —

2 gram $NiOX$

1 " Cd

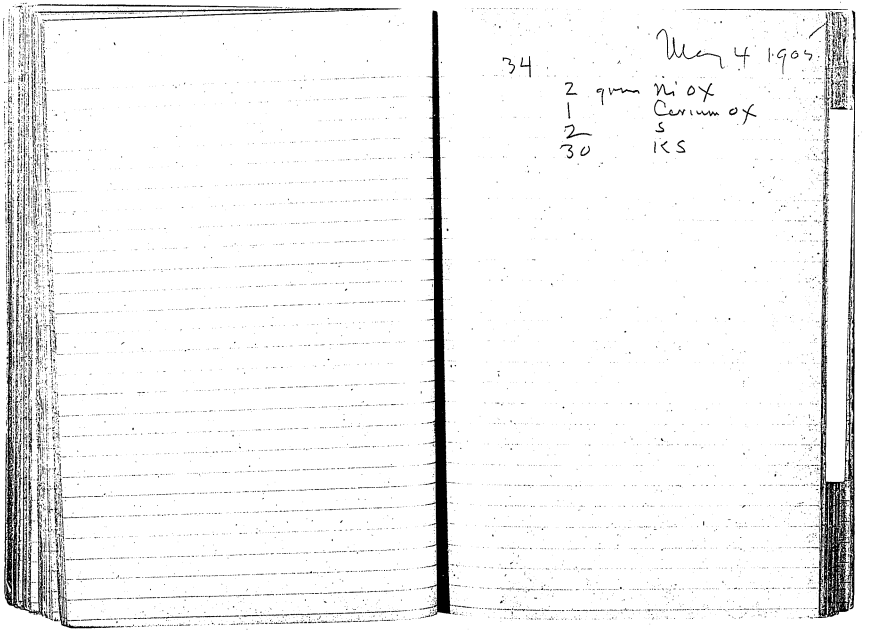
2 S

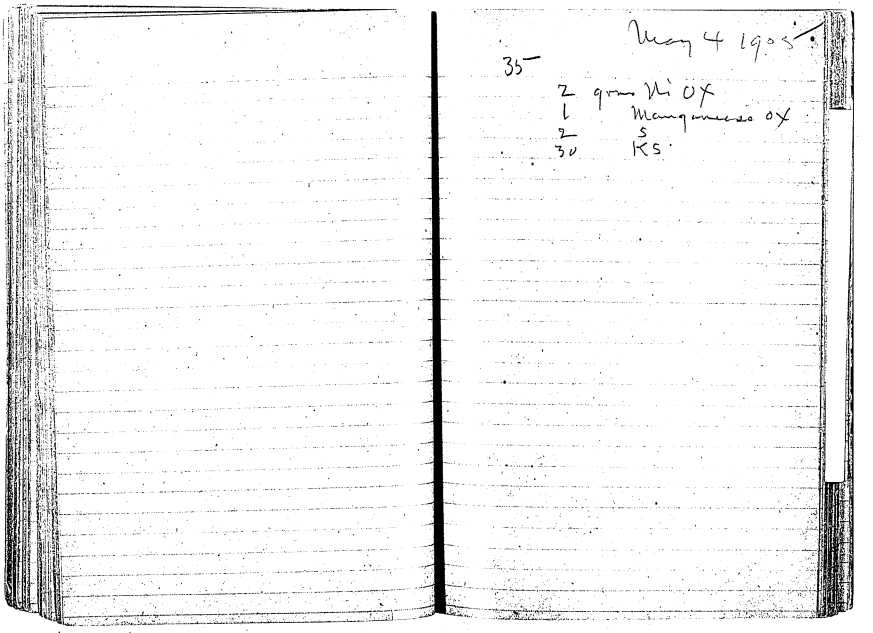
30 KS


May 4 1905

33

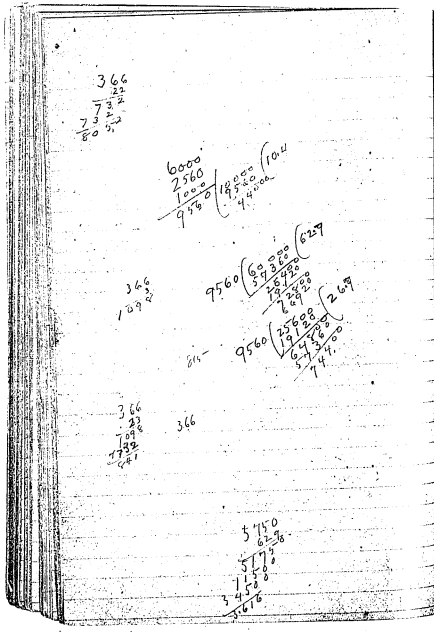
2 grams Ni ox
1 " Iron ox
2 5
30 KS


34
May 4 1905
2 grm Ni OX
1 Cerium ox
2 S
30 IKS


May 4 1905

35

2 grams Ni OX
1 Manganese OX
2 S
30 KS.

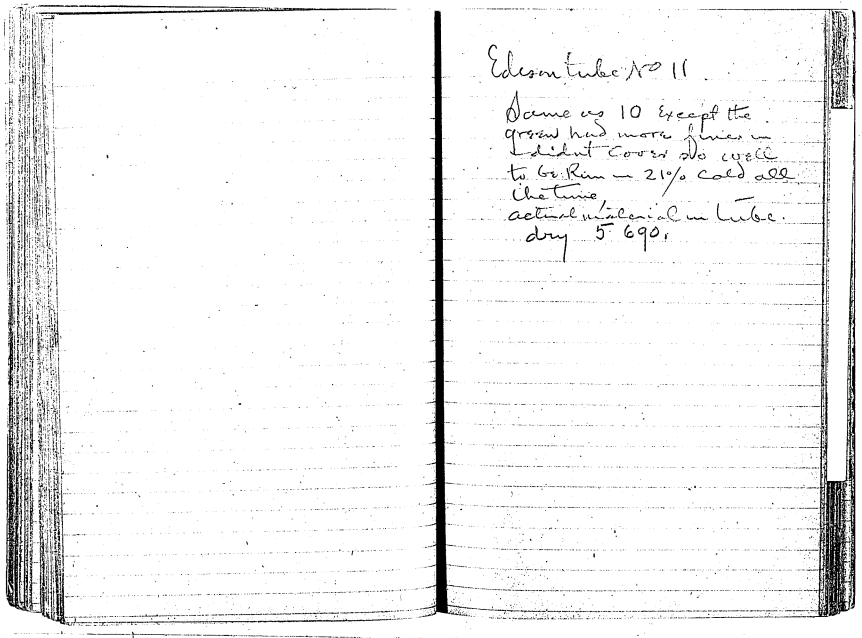


Edison Tube No 10—

6 grms green thro 20 on 180 — but not mixed with fine at bottom of bottle, hence longer than No 11 tube, it covered almost perfect .0001. Warren flaked flake 70 Co 30% Nickel & pr. Graphite Cu Copper to Comp. at Run in 21% Heat after 3 Runs Rej. Cond — to No 9444 — Packed ~~Cond~~ ~~Cond~~ Cond ~~Cond~~ by hand 7 Weight good Ends — Tubes. plated Co Ni alloy by Warren —

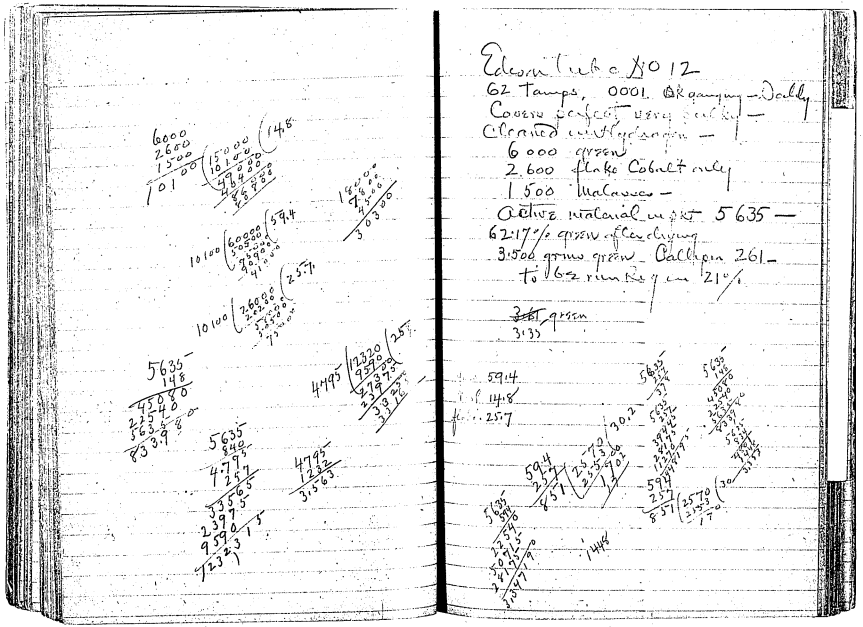
The mix originally

grms 6219 6 000 green 20 on 180
Mat 1314 2 560 Co Ni 70/30 flake
flake 617 Warren plated by Warren
1 000 Graphite
Active material in tube dry 5.750 —
3.66 green



Edison tube No 11

Same as 10 except the grass had more lines in didn't cover so well to Gr. Rim — 21% cold all the time
actual material in tube
dry 5 690.



Edison Lake No 13,

Same as No 12 except Flake Co ~~was~~ had ammonia passed after destruction or rather Cleaning by Hydrogen - This formed a Nitride, appeared bright & OK - Covers perfect very lucky - its somewhat brittle, 61 Jumps

Wt delivered in Cornish 515#
Calliper 263-
to Germ Reg in 21#
3.57-

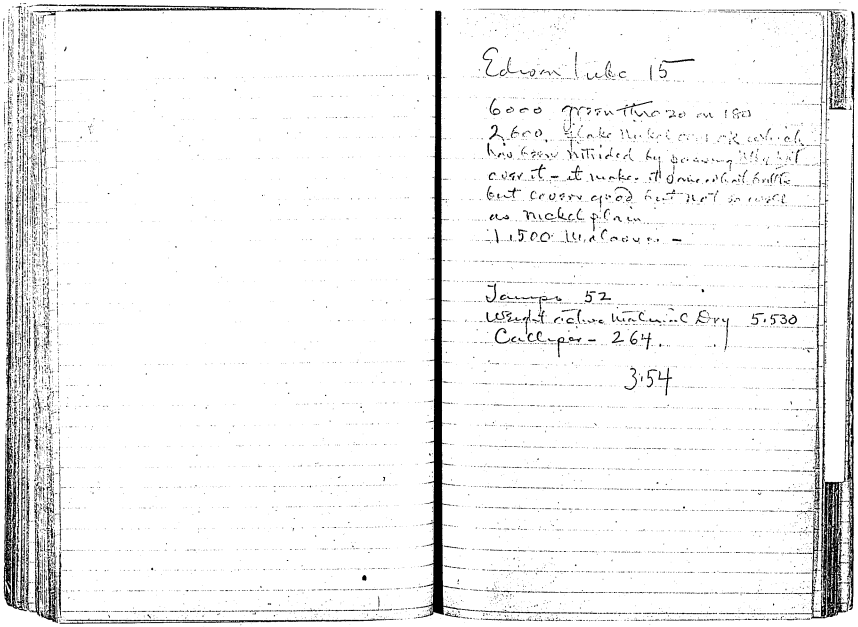
Edison Tube No 14

5.600 grms green with 9% Bi_2O_3 precipitated together — Tube 20 on 18A rather fine —
2.400. of .0001 ck Daily Cosmos plated film — cleaned in H,
1.500 Malaxis — Cocoa roasted but not as well as Req'd it is finer + appears Heat was not so G not so sticky apparently

Weight dry coating material 5.550
Calipers 258 [illegible]
Run — 21% Req —
Jamps — 58
Tube plated Ni alloy [illegible]

Tube broke at head put grms in new tube — probably Mg Natics nearly full grms before

3.55 grms



Edrom Lube 15

6000 grain turn 20 on 180
2,600 flake Nickel on 15K which has been nitrided by pressing Nickel over it - it makes the Nickel brittle but covers good but not so well as nickel plain
1,500 Undercover -

Jumper 52
Weight relative humidity Dry 5.530
Calliper - 264.

3.54

Edison Tube No 16 =
6000 Green thro 20 on 80
2600. Warren 70 Co 30 Ni 0001 ok finish
Screened thro 80 mesh. Covers very well.
Considerable but not an Expensive part thro
screen after Hydrogen is some shrinkage together
etc. Brick is only ½ of others Covering
Power is Good Covering power not material of
any difficulment—
Core 125 ohms
Caliper 260
Temps 48
Weight Req in Material .5430
Weight Grams—
to be run Req in 21%

A Reg tube packed with 3 lb
wet fall 5" with Reg
mix weighed 6.4485 — empty 1.380
Mix 5.068
Soaked in water 3 hours
then took out shook it
+ pressed thro fingers
weighed 7.458
gained 1.002 gms
or 14% in weight —
prob 25% approx —

June 3rd 1905 SB

Icy Sugar
Charmel.
Gelatin
Caramelin + Caramelein
Dextrin.
for coating flake N° on
Grain N° (Oil)2 —

Try ~~—~~ drying grain
on 20 30 50 80 100 120

150 180 200 - Dry flake +
Cover seperately as flake
is only in big or grains —
then mix together in
proportion that would be on
ball cap —

also take moisture + grain # so when
dry has 20 much dextrin as flake
dried dry -

June 3 1905

pack tube Oval

so it can have a chance to
swell round thus is very
important to raise Capacity
the degree of oval to be
determined by the Capacity
for same weight given and
test of Cells —
The swelling showed increase
the bulk abt 20% when
stop - thus is given by the
Oval —

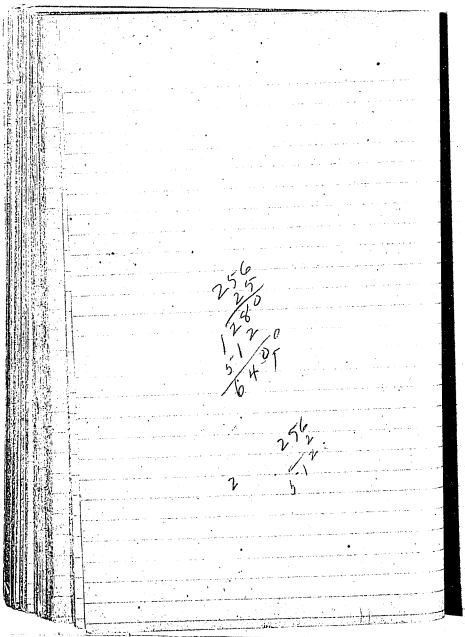
Expts show that 5" drop
abt 3 lbs weight is best
for packing material in
tubes & if 4 inch
tube abt 50 dabs of
active m packing best
Equal dabs —

June 3 1905

Hot Endurance,

5 Tube Calls Reg 3 lb 5" pack
70% Co 30 Ni - Round tubes, 2 4½ 9
Fe - Metal Calls 21%. 150 clio
rate,

5 ditto oval tube



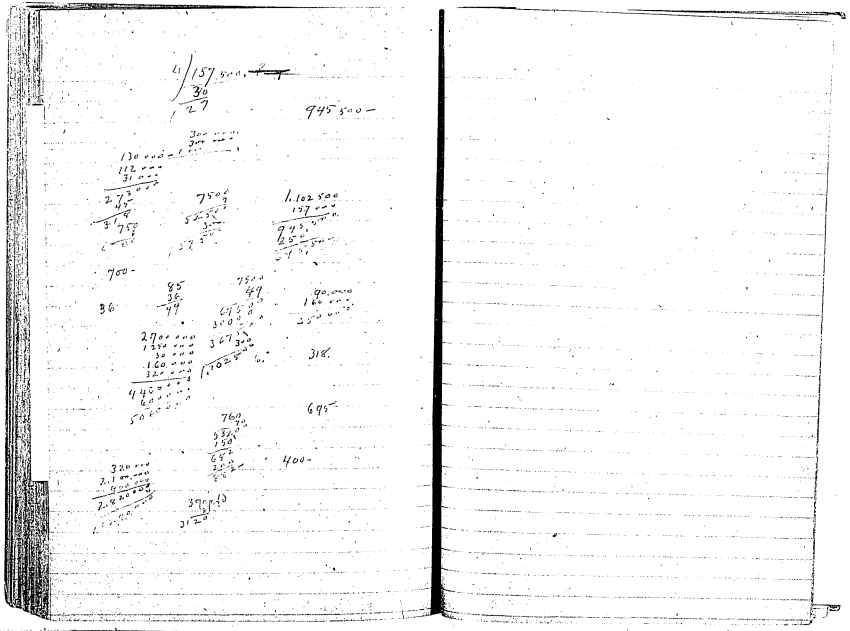
June 20 1905 SB

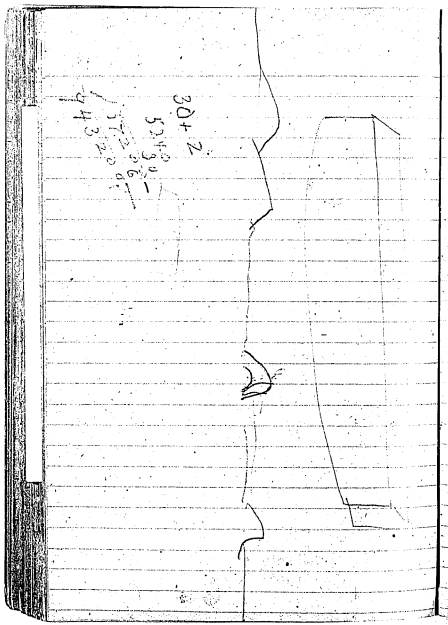
Think it possible that can use
muriate nickel in place of molasses
to attack flake NiO to green $Ni(OH)_2$
thus would make pure Carbonat,

Possibly very Conc Metaphosphoric or Hydrochloric with Nickel Oxide would be sticky enough to attack flake to green hydrate then put in KOH
Heat up to the $Ni(OH)_2$ to generate and the Metaphosphoric thus also would make pure Carbonat,

Expect to find a very sticky
Ni Salt Lactate Conc so can
be used in place Molasses
to attack flake Ni Co to green
$Ni(OH)_2$

Possibly if a nickel salt Conc
was mixed with the Molasses
it would serve the purpose
of making Carbonat by adding
with the Molasses in 1½% KOH.
Then pp the Ni in Stew —





6500 | 17500 | 26.9
13000
4500
3900
6500
5230
869
47070
31380
15690
14061
4000
1750
750
6500
5230
115
26250
5230
20250
20125
6500 | 7500 | 11.5
6500
10000
6500
3500
6500 | 47000 | 61.5
39000
8000
6500
1500
3216
1406 Kepke
601-gTucon
5223
4629 - grossup figure
5230
5230
615
2615
2000
615
3216
3216
1406
4622
1406 | 3021
1406
1616
210

Date	1	2	3	4	5	6	
25X	570	681	710	735	736	720	722
26X	566	668	696	720	723	705	712
27	517	641	671	686	700	677	682
28	587	670	692	716	727	707	715
29	685	800	817	837	843	827	825
30	812	911	927	945	947	927	937
31	684	840	856	887	892	872	885
32	750	873	907	930	930	917	930
33	587	786	821	842	850	823	840
34	510	682	701	687	706		
35	592	727	745	741	743		
36	535	717	744	722	737		
37	732	783	801	807	782	797	
38	721	687	641	775	688		
39	407	525	555				
40	530	725	760				
41	517	735	777				
42	493	747	794				
43							
44							
45	480	625	685				
46							
47	610	762	785				

Note. 38?

*Remarks. 25 to 28 wire dried before weighing in from 29 columns not dried - notice better in quantities formed in wire not dried -

48			
49			
50	425	486	
51	"		
52	500	570	
53	515	580	
54	622	676	

4823 - glucose gut

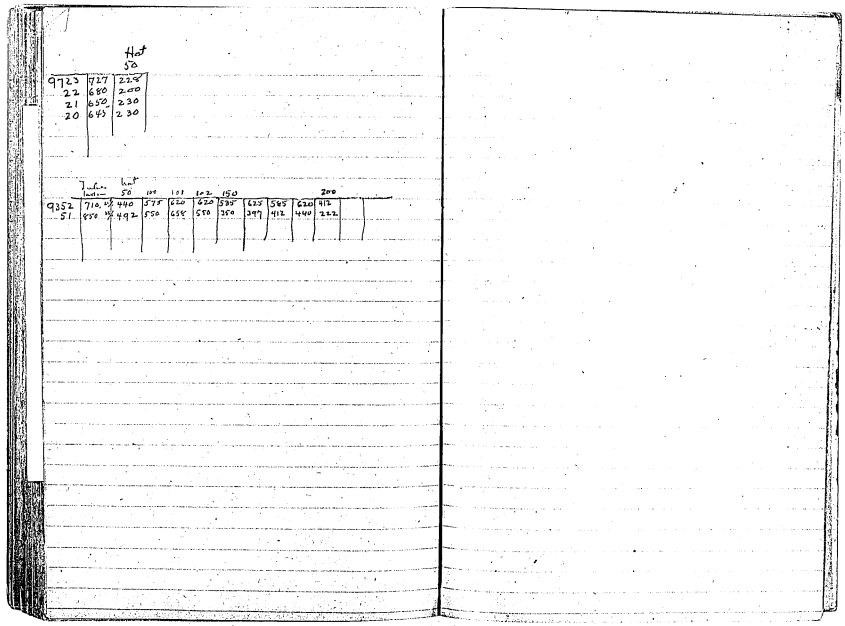
55 | 650 | 722

5810 / 17 / 4823 / 987 / 4836 / 1162 / 3061

25 | 712 (28 / 24 / 4823 | 11620 (24 / 96 / 212 / 192 / 203 / 192 / 11 / 0

61 | 61 / 27 / 88 / 1 | 1220 / 2700 / 1200 / 100 / 27 / 6 / 21

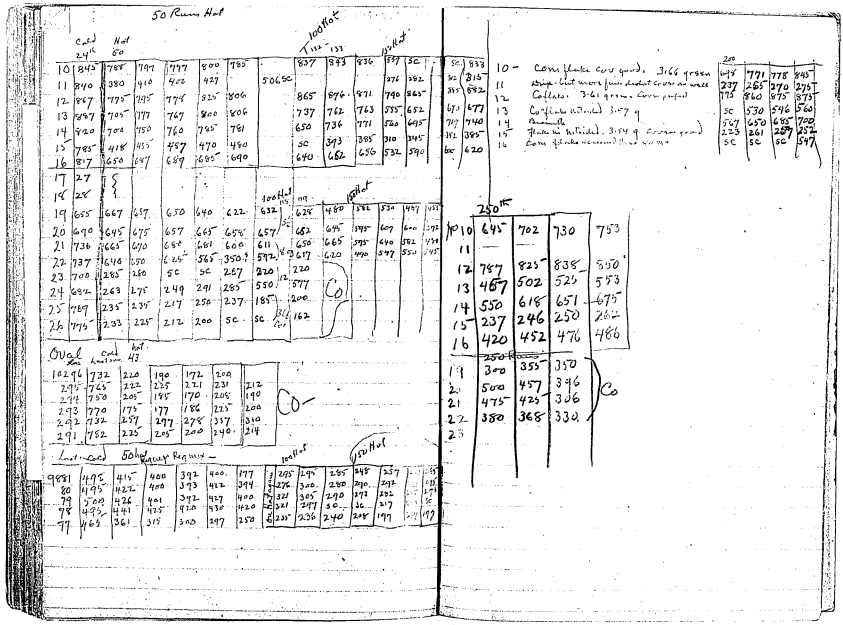
18000 6150

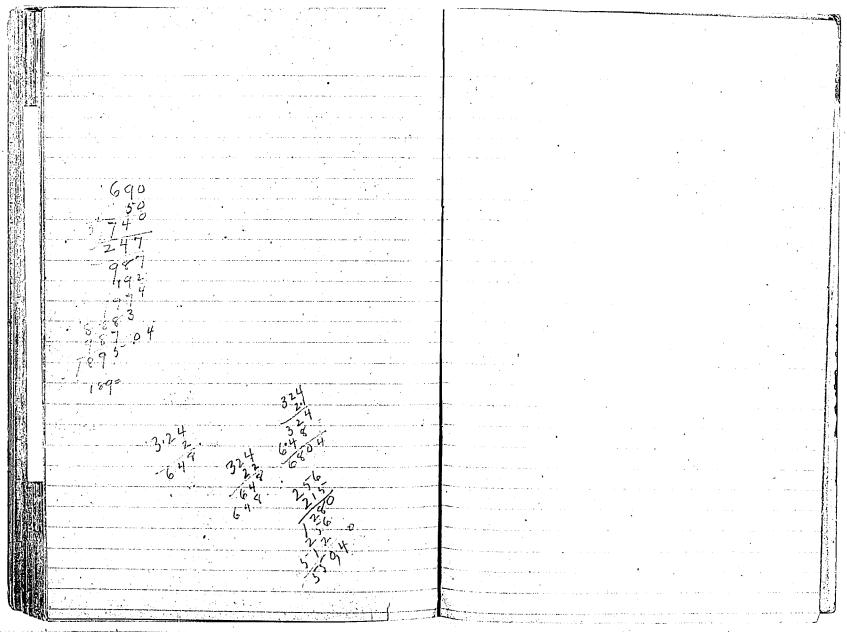


Hot
50

9723	727	225
22	680	200
21	650	230
20	645	230

	7 wks. hot		hot 50		100	125	150				200			
9352	710	15	440	535	620	620	585	625	595	630	415			
51	689	15	492	550	658	570	504	397	412	440	442			





Ray Tubes Required for 1 side

	Cold	41%	Hot 28hr c'd	32%	87%		90	33%	
9475		885	637	682	431	392	430	485	5
74		850	655	760	545	502	530	590	6
73		775	650	495	sc	250	232	330	2
72		872	887	825	665	592	673	731	7

Hot — Hot

Need 22 more hot tests.

9475	580	492
74	635	627
73	245	185
72	750	757

Oval tubes — one set = 33% other = 21%

102 96	670	712	780	732
95	680	725	805	769
94	672	697	805	750
93	675	725	800	770
92	677	705	782	732
91	725	747	817	782

on half test,

Hottest

Regg tubes, Regular Corrugated all

10316	707	775	780	777	792	790	800	842
315	730	775	780	780	795	785	790	800
314	712	825	825	807	807	806	812	816
313	727	830	840	827	820	825	828	830

Same mat corrugated all

10324	692	765	816	830	843	835	687	762
23	692	775	821	835	843	835	665	761
22	692	847	820	828	837	870	675	761
21	657	832	817	817	837	870	675	761

Hottest

Time going from 1 end to other end of test

10379	820	730	747	805	805	825	
78	527	753	805	835	835	835	
77	570	793	837	835	835	870	
76	575	770	827	837	837	870	

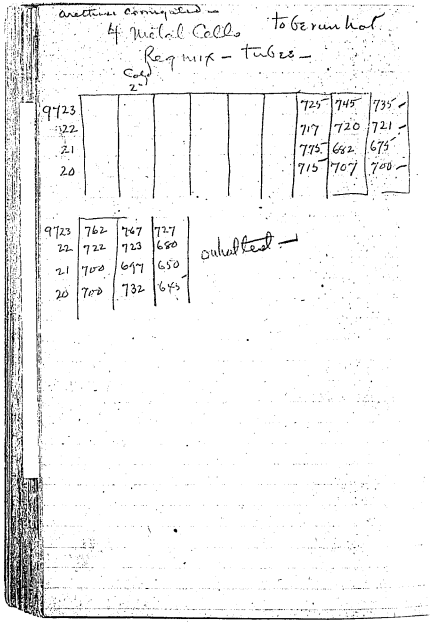
Hot test

Run Hot

Heavy corrugated heat resisting metal tubes

Oval Corrugated one side flat

10320	472	705	785	793	812	825	840	842
19	592	710	775	796	813	827	840	842
18	512	742	815	822	845	852	856	858
17	577	780	846	860	867	880	887	884


Reg mix – tubes –
9723 725 745 735
22 717 720 721
21 775 682 675
20 715 707 700
9723 762 747 727
22 722 723 680
21 702 697 650
20 700 732 695
outlet test

Hot Test- Conny

Tubes - Rag mix — 44 Rumpshot on Endurance

		original	45	46	47	48	49	50	51	52	
9408	33%	801	437	425	412	470	467	473	435	475	41%
06	21%	763	350	299	317	sc	290	390	337	375	51%
05	"	815	435	460	467	570	505	516	477	500	49%
04	"	811	537	575	600	625	305	650	622	653	79%
03	"	785	275	277	300	337	720	340	305	300	61%

Flat pockets — Ni:

		orig	45							
9414	44%	375	417	410	450	425	422	432	427	417
13	"	400	420	465	455	415	415	433	425	417
12	"	375	387	375	375	367	383	389	390	377
11	"	427	430	433	430	426	434	436	438	423

72 Cond

	45		
9414	0	1200	1200
13	sc	1250	sc
12	1305		1250
11	1200		

	67		
9414	sc	1200	
13	sc	1250	1200
12	1200	1337	1950
11	1305	1555	1900

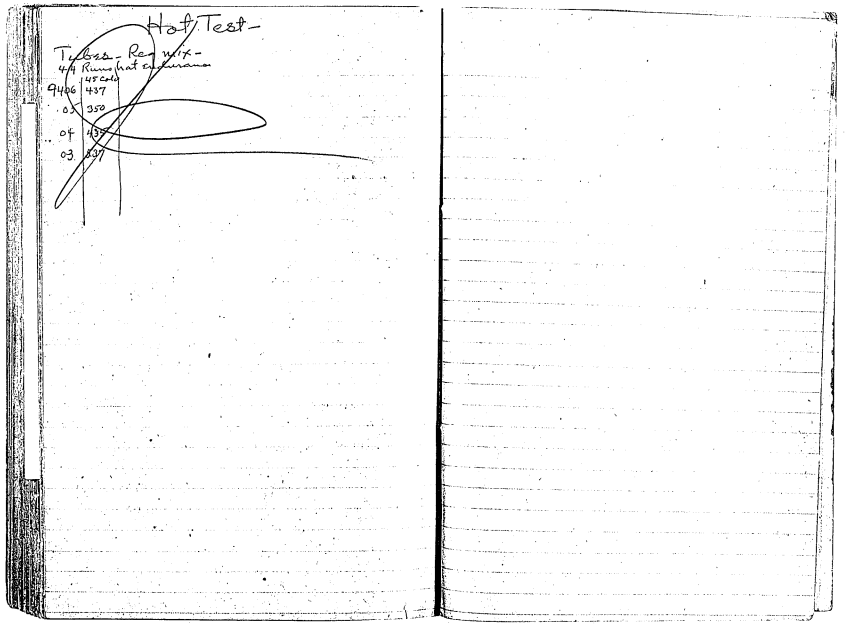
4pkt Ni — 6pkt Ni + coat

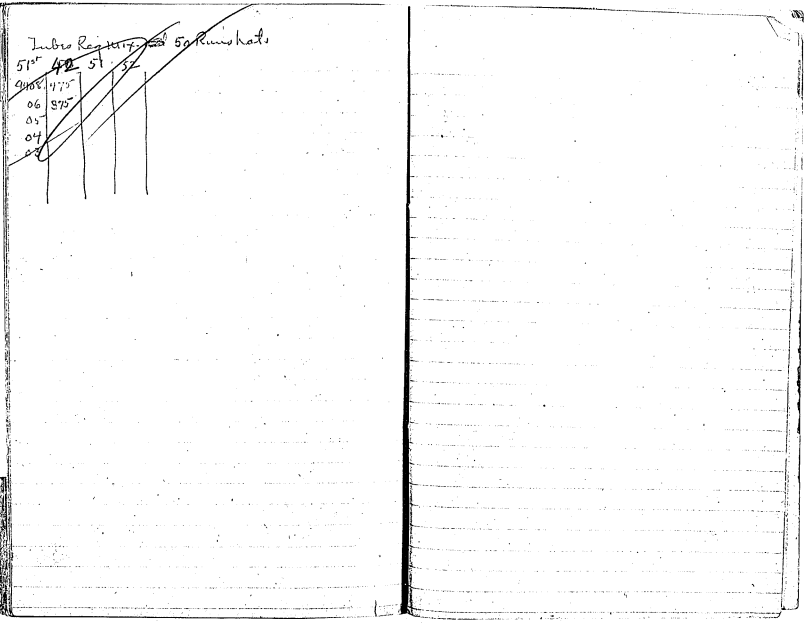
	67	68	69	70	71			
9414	sc	1200						
13	sc	1250	1575	1617	1755			
12	1200	1337	1950	1700	1800			
11	1305	1555	1900	1533	1600			

460	416	
467	416	
420	412	
475	445	

Split CO

	83		86			
9408	410	347				
06	132	150	160	155	172	
05	410	400	380	432	375	
04	565	550	535	590	570	
03	142	145	172	162	174	


Hot Test -
Tie Bars - Re-mix -
44 Runs hot sequence
9446 | 45 cm
.05 | 350
.04 | 400
.03 | 337


Turbo Regt
5a Rims hats
51"
42
51
32
9.108
4.775
06
8.75
05
04
03

~~9977~~ Reg 312 Minim-Reg pdate, to 9a mv hat last

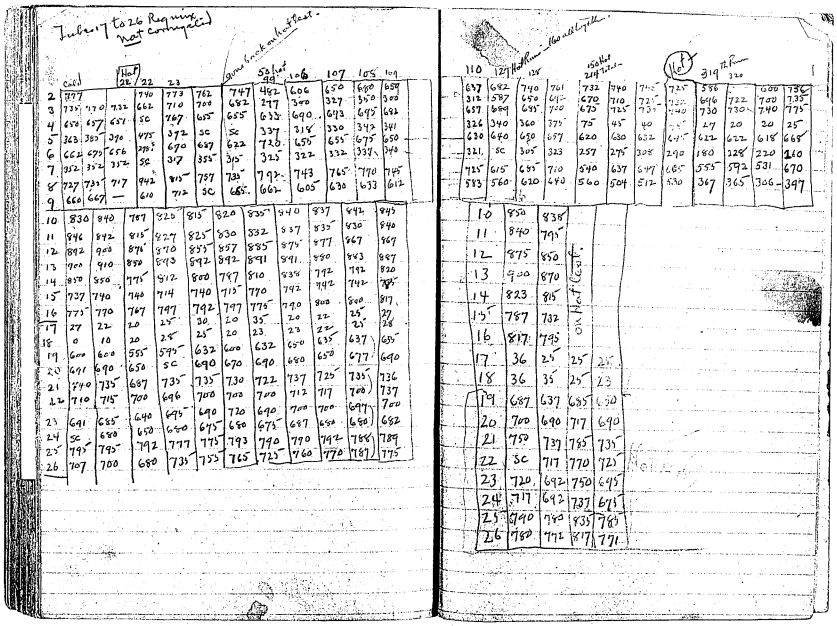
Col 1									224 Hat 200
9881	475	476	450	495	458	497	515	498	241
80	470	475	477	485	462	487	509	495	270
79	485	490	490	497	492	500	512	500	247
78	490	491	495	496	490	500	512	495	273
77	490	483	463	472	465	472	477	465	185

after, 50 hat runs 99 Total runs

Edison No 9	99	560
	8	792 615
	7	325
	6	720
	5	337
	4	633
	3	277
	2	482

Average valliage on 99 discard

2	117
3	115
4	124
5	114
6	117
7	123
8	114
9	116

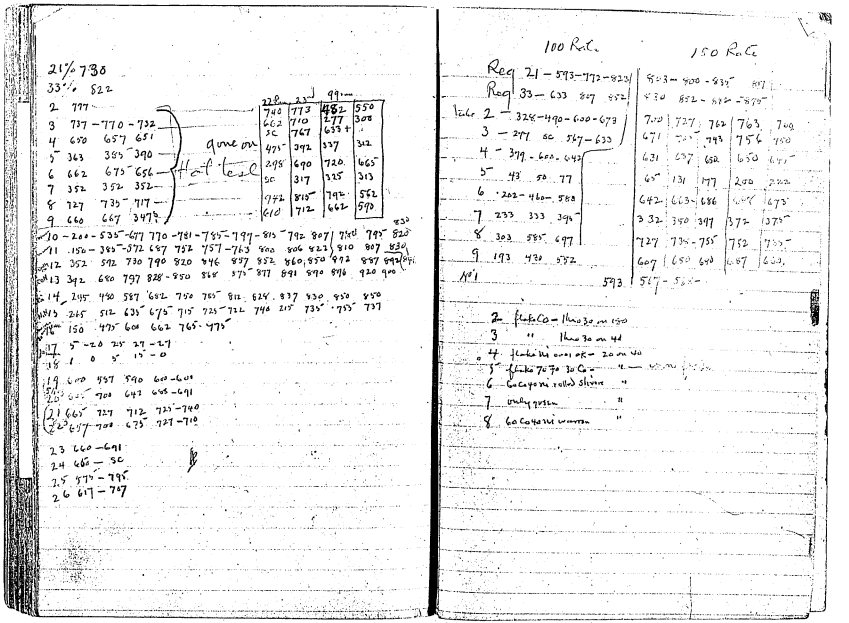


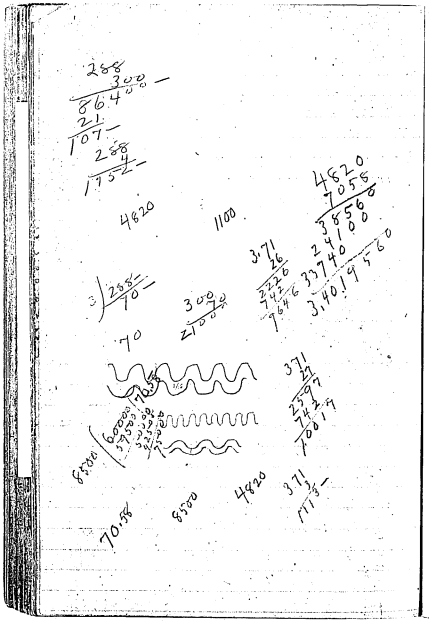
Heat.

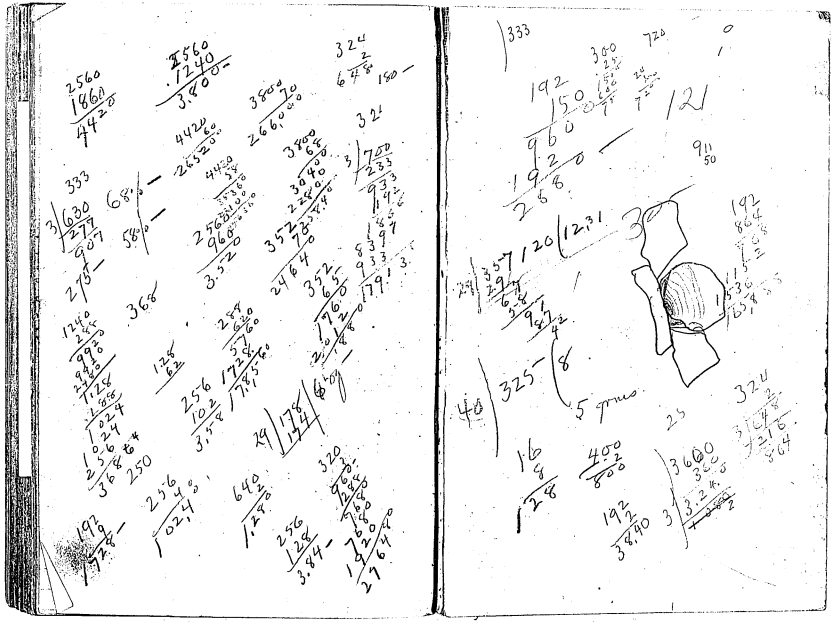
Actual length of heat tube (full)
2.1175 —

4 inches

passage —







Notebook, N-05-03-02.2

This notebook covers the period March-June 1905. Most of the book contains notes, primarily by Edison, regarding storage batteries. Most of the entries pertain to electrochemical preparation of nickel flake and to electroplating cell components such as grids and pockets. In addition, there are notes relating to the loss of cell capacity associated with the swelling of the nickel pockets. There are also tests of cells using cobalt preparations, along with assays of nickel and cobalt ores. Several of the entries were witnessed by Frank L. Dyer. One page of notes has been inserted into the book. The pages are unnumbered. Approximately 200 pages have been used.

March 2nd 1905 — 822

Experts on making porous metallic Carbon for Battery grids by Reducing ni ox + then acting on nickel by KOH + NaCl to form peroxide of the porous also by Electrolysis by soaking in Mn Salt + action KOH + washing several times until porous filled —

Cake of Dehydrated Ammonia Chloride Ni — 250 atmos pressure — at quite high heat perfectly worked together + porous 4 gram Carbon Calliper 108/1000 shrunk to 137/1000 by high heat + 65/1000 lower heat at lower heat the Ni is perfectly reduced

[1]

Mch 2 1905

+ macroscopically globulated + crust ~~coffee~~ coherent Rahmen for practical use but the highest one is OK- its a little curled but it is - is due to bad conditions in small glass tube. Think they can be brought out true = The 65/1000 Could be used in a Lamp -
The 37/1000 squeezed 250 atmos Coal gas 11/1000 - porosity 5 to 1
(+) porosity 81/4 — width 3/8 inches 1/2
So the porosity 62 less - Total Shrinkage 36 Tims

Make following Cakes —
Ns Amsdona Cll —

1	6 grammes Ns Amch- all		250 atmos ✓
2	4	"	1 gram Magnesia Ox - ✓ 1-1
3	4	"	1 - Phosphate Lime - a ✓ 3-1
4	4	"	1½ grams Chloride Ammonia fine ✓ 2-1
5	4	"	1½ gram Magnesia Oxide 1-1
6	4		2 grams Magnesia Oxide 4-1½
7	4		1 gram Chalk ✓ 2-1
8	4		2 grams Chalk -

LLD

March 2nd 1903

4-1.

9 = 4 5 grammes Ni Salt. 1 gram Zinc Oxide
10 4 5 " 2 gms " 2-1
11 4 5 " 1 Carbonate Barium 3-1
12 4 5 " 1½ " 2-1
13 4 5 " 2 " 1½-1
14 4 5 of the Nickel Salt alone
15 4 5 gms Ni Salt, 1 gram Chromium Oxide
16 4 5 " 1 " Manganese peroxide
17 4 5 " 1½ Bismuth Carbonate,
18 4 5 " 1½ Carbonate Zinc -
19 4 " 1-1 gm Manganese wet with acetate Nickel
20 4 " 1½ "
21 4 " 1½ 1½ Lampblack -

22 5 grammes paste Ni Hydroxides squeezed in press
M1763 with 2 grammes Manganese Oxide -
M1763 well on Mortar, of such a pressure that it
will not squeeze out on grave, take 1 gm
Nickel & squeezing each step - 2 SOAT
wet filtered

23 4 grammes dehydrated green
Chloride of Nickel, see Edison about
dehydrating —
228

24 4 grams anhy Ni Chloride
Manganese Oxide

25 4 gram anhy Ni Chloride +
1½ grams Manganese Oxide [E]

No 1 alloy — is
flake nickel from filings
Reduced in Hydrogen — it
stuck together somewhat
but could powder it by
fingers — its Companion
Sample not thru Hydrogen
only grms 3.57 to Volt
It takes stuck together
a much wonderful
Cover even with
3 grms to 6 —

Alloy No 2
grey fused alloy-flake & H,
often disperses —
Runs pretty fair —

March 8 1905

good way to make Ni Co Scale
polished sheets put in closed
space, pass H, while hot,
then HS, this makes a film
of Sulphide colored Copper
off 2 way – these are then
put – into heated [illegible]
oxd to then Reduced by H
great recovery power –

We are now experimenting on
Ni + Co + other alloys
to get the Sulphide & take
it higher – not to Grind

Tried Oth making the buffed strips
for qwer to be acted on by Solomutes
Hydrogen J_2H, SbH AsH
possible SiH, Very thin to be put
in suitable [illegible]
KOH, high density C[illegible]
ace of the Surface dec[illegible]
Bi_2 Sulfide don't seem
work to apparently all[illegible]

[9]

March 8 1905 220

by the Odd Drain —

We are Coating Ni + Co flakes by Rolling process with thin skin of the Metalloid Hydrogen Compounds which will just enough S in sumpon to form a sulphide with (destroying flaky Gold) of the flake + the Ni_2S or NiS for whatever sulphide is formed shows no action after 24 hours in KOH + the same Current density

The 60% Cobalt 40 Ni alloy shows nothing except a slight brown tinge — CN Silver Gold all flake Solution pink or violet 40 Ni 60 Cobalt no action except brown tint

Iron going make some flake Silver by using aluminum fusion process

DYER

GZD

March 8 1905

think we can get it thin enough to use with Ni(OH)2 its first attacked by acids & alkali. —
As it can be rolled pressed it could be used as a grid for Lead batteries if closed cups to prevent Lead or Compound out —

Duncan is making flake Zirconium — Just write us up to Cost of flake w.e.f. Zirconium TS. Please —

Make some Limestone 30 mesh or 50 use Hulse cup spot thick nickel flecks so it will cover all bright. Use spot about 2.2 grams Mitchell Mk 50 12 press, then Sork, then SP 100 Cor 200 & put in Hydrogen & fuse. Mix flecks Coppering-clean & lose out Lime & the Oxide with KOH + NaCl

[13]

March 8 1904
Up as far as safe to go —

Alloy No 3 - Edison
60 Ni 40 Co Rolled
in Rods

Alloy No 4
60 Cobalt
40 nickel —
Entirely to Chuck
dont Cooler - Soon
3 1/2 q to 8 qrs m

(1)

March 10 1905

№5 Ε Molybdenum Fe
Metal powder

№6. Ε. Tungsten Metal powder Fe

№7 Ε Titanium Metal powder Fe

№8 Ε - Oxide Cerium - Ni

№9 Ε Iron 80% Boron 20%
powder - Metal - Fe

№10 Ε Metal Manganese powder Ni

№11 = Crystallized Silicon
made by Dunn -
Big Cornwall process 842 plenty

March 10 1905

E N° 12 – Cobalt f Cake
plated about .0802 Gr
Dully + Cleaned in Hydrof
by febroquest – dont
look very bright –
its in slivers, its bulky
but covering power not
good, am going to screen
some thro 20 –

E N° 13 – Thro is N° 12
Screened thro 20 mesh

E N° 14 = Silver foil in book
Covers fine –

$20

Mch 10 1905 — 820

Copied from small note book Mch 5 1905 —

To make cg non magnetic
Ni flake by rolls & oil process
Ni flake by rolls & oil process with Hydrogen also Co —
Try flake Ni plated with Au & Pt —
Try cathy Ni_2O_3 with flake Ni but 1st $\frac{1}{2}$ OK try with flake Ni

Mch 10 1905

Copied Continued March 5. 1905 –

Its advantages to size product of $Ni(OH)_2$ production. Thro 15 on 30 Cut as this is not very Consol Can make it 15 on 100 mesh Making as much Coarse as poss to Reagan less Ni Cases of Cake to Coal surface. That if it was fines That powdering 100 mesh is ground fairly & first Crack into The mundy $Ni(OH)_2$ in process of mfr & used agn

Heat Uranate Ni & K + see if Carbonate also what Hydrate

Ni flake Coated with Ni_2O_3 anhy & used – also Ni_3Co_4 acts as 1/2 + 1/2 Coated Co_2O_3 then Made anhy

23

Mch 10 1905

Copied Condemned Mch 5 1905

Looked very thin & Cakes granulate from acid to 26 ccc 6% Formaldehyde Cord Light,

Get some Mi Cups. Color lasts from long time & are yellow tinted & fuchsia about that in ccc Clear it or macerate & dehydrate where it can be cleared Cholyl ccc

Get a couple 33% qua Cap packets dry one with Koth in & Recor 75 the other soak 10 mins H_2O & Re Cor put back in 33% note swell Clear 2 & off Cas

Try a Sulphurous & fuchsin Mi strip & Cholyl in Koth.

212

[25]

Mch 10 1905
Copied Cold-Mch 15 1905

Put in following alloys
~~Ag~~ 70 Co 30 Ni — 80 Co 20 Ni
Cu plated Ag
Cu " Pt
Sulphurized Ag Ni Co Fe Pb
Bi Mg Cu Cd Ub Mn Cr

Arsenide Ag Can't be deposited as all its Salts by existing Exam from in alkals

Try Steps Ag Sulphyd also Selenyd

Graphitoidal Silicon

Silicides —

Graphitoidal Silicon not decomposed by acids but Acids Chlorate K Boh or alkals

[27]

March 10 1905

Copied Card March 5 1905.

See Ratchford Titanite, Chromite a Conductor also Molybdenite

Silicon alloys ni. Co - Elec

Niobium Nitride Conducts Elec dull black powder not affected by Nitric acid by Aqua Regia -

To make nitrides Electrolyze fused metal as positive & plat in an Ammonium Chloride Sol

March 19 1905

Molyb. dale Phosphide Conducts Elec

Tungsten Nitride not decomposed by acid or alkali

Mch 10 1905

Copied Cent Mch 9th - JKD

Write Benjamin about Vermont for Cams also the Hamilton Oil Stuff for Cups

Plate Ni on Iron both sides then roll out to flake Cent non out work by heat, also plate Ni Co 60% Co 40 Ni on non then dozed in H, roll out flake & Cent non out.

Trap packet with Aluminum Gauze also with H 7 7th Side —

If electrode with Cathode Both metallic Ni in H — forming a hydride then Hedenberg Co. If nitrogen then use Mg & Li also in atmosphere free of N The plated Ni Co Semi alloy heat in Co to weld w/

Mch 10 1905

Copied March 9 1905
in Various previously displayed
air by Co.

Take 2 more 33% Clyd dry
with Roff, then ReCdr 200
then soak Water, put 1 in
33% then other in 21
see swell

Plot swell of grain from 20
to thro 200 sds. color
greatest swell also
Compare swell Beg
Reg Com 33%

Mch 10th

Make a Co by H. powder
15% Hg run thro 9's
get chg + deploy vacuum
compute Eff

Eff

33

March 10th 1905

Curious – Why Nebt string acetic a decomp the black N_1O_2 + CO_2 & lime out of Cupellation hood Rio Direct flame

See if Mal reacts with remainder Cr Pt in N_1O_3H – soak 48 hours

March 11 1905

Make pockets already Cut Pt with one Exception with flap Put in Pt in Ded Cupellation then fill at Ends close flap Put in grid + Reflector Light pressure grooves Edges Cup also Cupellation fleeing

Could fill Cupels only by assembling in frames in Cupels fleeing say 1/3

(25)

Mch 11 1905

Churn tamping + 50 on

Make a Reg 218 with .6
of 3/1000 glass fibre mixed
to give porosity

When get plenty flake
make group 20 or 30
then sift in when cups
150 mesh Ni Ø(OH)₂ into
interstices then press
ditto 20 or 30 fill cup
pour molten paraffin
press & dissolve paraffin
out
or what will be better
perhaps put cups together
& hand press then ~~dip~~ fill
with paraffine by dipping
hot & cooling then
dissolve out this leaves
porosity perhaps something
harder than paraffin
better paraf dis out
Sugar flowers

ELD

[37]

Mch 11 1905

Make some Ni flake by usual Oxide. Then reduce H. To get rid Nitrogen.
Also Reduce in CO to get rid HCN

Try Grannan Silver flake

Alloy of Ni + Al
At 6 Ni large Tin white
Lamellae SG 3.67 by
Melting 8 pts Al / with
3 pts Sublimed Ni Cl
20 pts Chl KMg treating
Regulus with dilute HCl

Ni_2Sb_2 thin plates
Thin flake would work
in Na process

$20

Mch 12 1905

Alloys
Ni 50 Cu 50 plate out Cu
see if falls plates —
also precip by KOH from
Chloride - the Ni & Cu as
hydrates Rid by H
& then plate out Cu
the Ni being left as oxide
to be acted on by Reagent
as NaCl + KOH Sol —

Mch 14 1905

Treat Reg E. 18, Ni gr. when free
from KOH with Bromine
Water after removal To
make acid the new is reduced
to metal. - The Br will
remove the iron + clean
Ni possibly there is
some G. & Base Metals
Get gr. & pkt —

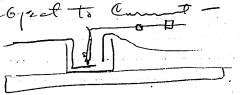
220

[49]

Mch 14 1905 — FLD

OVER

Make machine to test
Contacts immersed in KOH
+ Zn Oxal to Current —



Swelling may be largely due
to Crushed + Compressed surface
at Contact Get mix + pkt
+ very closed flakes so friction
of gas Exit at Ni Cas very great
Try flake Co 60% Ni 40%
Ni Graphite Cast with very
open flakes — Can file burrs
Dec. of swell diminished
in [redacted] also thin + fine
CONi Reduced by H. + black
with the flake attitude —
so when Compressed
these particles keep flake
from touching leave
air [illegible]

[43]

March 14 1905

Groups 700 mlg Alkna mixd with Reg mix- Cor 200 - Soak —

ditto Cor 200 soak rec Cor 200

ditto dont soak —

Put a grid on Campos & clyt thus 33 only below 10/1000 Swell content 2/1000 Edges Then new pour Clinkers —

£20

March 15 1905 —

No 15 Σ = a bulk of K Sulfate Equiv to 8 grms $(gr_{ass}\ NiOH_2$ 30 on 80 mesh 1.250 Malaxeur 2.5 0001 flake ni ppt'd. red by H — well covered — great excess very bulky — 3 to 6 z soaked out, washed in H & Edison to soak in Ammonia Solution from Ni_2O_3 hydrate — press to 6 z filtered air for no possible by dipping + drying many times —

Edison No 16 — Dup of 15 but with 0003 Nickel flake — & 1 gram malaxeur same bulk KSO_4

Edison 17 · Mg wet with Sulfate Cu & K — worked & mortar — pressed / Cake 200 almost heat cherry red — powder 30 on 80 — 3.700 Mg 500 mil g Malax - 1 gram 0003 flake ni —

March 15 1905 –

to 6g soaked free KOH. Dried & given to Qual to run to Worden & heat in Hydrogen. then given to Edison to dissolve out MgO by dilute HCl. Then fill with $Ni(OH)_2$ by Solution process –

RECEIVED

Makes one MgOx 20 grms 15 cc of a 4½% Solution of K_2CO_3 – Hand ℓ. grind 3 gram Cakes to be heated bright yellow & .30 on 80 –

on pressing at 250 at 6 squeezes out to thickness two cards, I now add 10 grms fresh MgO. to mix – 4 gram Cake –

This makes 30 grms MgO 15 cc 4% K_2CO_3 Solution –

Even this is too much liquid but its near – Cake is fine –

I Now put in 8 grms more MgO – making with what lost & made in Cakes approx 40 grms Mg to 15 cc

(49)

March 15 1905

40 grms MgO + 15 cc of a 4% solution of K_2CO_3 would mixed seems to be ok for making Cakes. Now we will dry Cakes & bring them up to yellowish volute & crush to see if ok =

after heating to dull volute - Shrinkage is Loss than 5% =

its more friable than it should be wants to be little stronger but can use what we have, ok I think -

FLD

Mch 15-1907

Using Sulphate of Palmyra of a bulk equal to 8 grams of MnO_2 thro 20 on 30 weighs 10.560 grams

When sieved thro 30 on 80.

For group 1, 5 of requires, 21 grams

Equal to 16 grams MnO_2 20 on 30

8+2 would be 4 grammes of flake —

2 grms Molasses

FZD

March 16 1905

The Cups made up with
Mg flake & Sulphate of Lead
Shrunk too much welded to
Bottom side of Cup -
Possibly add the K_2SO_4
that got out as wet deposit
test for Sulphuric - & possibly
Heat Too high - The flake
welded to Cup OK -

A Cup which only had
flake in welded OK &
deposit shrunk thus
would be OK but is
almost impossible to
put it in Cups without
we must have something
to back up the flake -

I am now going to
try Sulphate Magnesium
with flake -

Z & D

(55)

Apparatus 19th after 750 hours
1 amp. down by
on 2" surface

1S – Browned
19 Red some rubbed off
20 only four patches
21 Red some rubbed off
22 "
23 Red brown. Rubbed off -
24 Brown. Considerable scale off
25 Brown. Strong
26 Red brown. Scaled off
27 "
27 Just a blush of brown
28 Browned.

old Thermo alloys Mch 21 1905

Alloy 18 ingot put on 21½ 2 amps
in Mch 20th – Mch 20th –
Ni 10 Iron 10 – Browned slightly May 15th
820

Alloy 19 Ni 15 Manganese 5 –
Browned slightly May 15th

Alloy 20 Ni 15 Bis 5 –

" 21 Ni 15 Antimony 5 – } Both pitted badly
" 22 Ni 15 Tin 5 – } May 15th 1905

" 23 Ni 10 Copper 10 – Bright

24 Iron 15 Ni 5 – } Pitted slightly May 15

25 – Bismuth 15 Ni 5 – Badly

26 " Antimony 15 Ni 5 –

27 Copper 15 Ni 5 – Browned slightly May 15

28 Cobalt 10 Fe 10 – May 15 Bright

(21) 29 Cobalt 5 Fe 15 – May 15 Browned Scaled

March 22 1905

Assay 26- gives 66 lots. gives
after Current off- Assumed
finely divided Ni + Sb
might absorb enough Oxygen
to act as a preventive deposit.
could find heat properties —

Note

Weight of ignited Tricalcic Phos
Equivalent in bulk to 8 gms
Ni Oxide thro 20 on 30 — The
Phos thro 30 on 60 —

5.820- showing it lighter
than Ni Oxide,

· Call it 6 grammes as the
Equivalent —
Use 1 gram Metal as assay —

FJD

March 22 1905 FED

No 9080 of test book

No 7 vs Edison No 30

pocket filled with Cobalt flake not quite enough to fill - then reduced with Ni wire - + dipped 5 or 6 times in NiOH dis in Nitty + Carb Nitty - + dried each time finally soaked 2 or 3 hours 21% KOH. then washed + dried - 1 Lot of stuff which was reduced with Ni wire

Obby full off - wt right original 4.467 -

now 6.1771 -

Think that not heavy flake enough Use formal dip composed like whole thing to side

(47)

Mch 23 1905

Edison No 31

first cups pressed with
McCallum Gasket one end
open — filled with Splint
Coal not [illegible] Cake 6½ pounds
0002 — [illegible] to 6½ pounds was
to weld in Hydrogen & then
to be dipped 6 [illegible] 2 down
proper number hours in
Valve m — 6 M. Otts in Ntby
No 9081 two Splint Co flake
No 9082 " Short Cubed Co fCake
6 50 mely just fills - tamped fairly strong -
No 9083 — ditto { all but 1st one flake
9084 " { removed these 20 mely
9085 "

Edison 32 –

9086 – same as 9085 but the Cobalt flake screened thru 40 mesh – wants about 675 of this size –

Edison 33 –

9087 Thru 40 mesh flake put in by jarring no tamping about 620 went in – could have jarred more into the 650 or 9 guess.

Edison 34 =

White Sat Sealed Cake Mg O – Thru 20 on 40 –

6 grms equivalent in bulk

1.7 ft flake Co 0002 – thru 20

750 mils Alkaline

Dont Cover wake Heal –

dont seem to stick

Enough – previously wet

& Dried Mgd –

The ammonia sol after 102 dips - bottled KOH, but ~~washed~~ washed + dried weighed.

9081 grms 1.388
9084 " 1.130
9082 1.279 -

After 142 dips put them in 33% KOH all night high up on board 1½" over plate, running washed well dried.

Weights 9085 12 310
11 265
1.042

9084 12 760
11 399
1.361

9082 12 920
11 343
1.578

9086 13890
11850
2.020

9083 13455
11 351
2.104

9081 13300
11677
1.623

No 1

March 24 1905
Grids from March 23 1905
Weight Grid # 9081 = 11.677

Weight of Grid # 9082 11.342

Weight of Grid # 9083 11.351

" " " # 9084 11.399

" " " # 9085 11.268

" " " # 9086 11.8505

March 23 1904

Notice considerable green deposit on bunch of Cupr Chl not on grid — probably dust entrained up the — also notice a few dark spots when I had dipped too near hot plate surface — seemed to oxidize — probably turn them hydroxide —

The flake (Test 40 has very much more capillarity than 40. Should use nothing less than 40. Think this about right size —

Also test 5 deposited 62 drops very slow on green willemite form on counter. Cup to drain out Solution quickly — after sponge the soap H.OH, wonder its capillarity is so great it wicks up the counter —

March 23 1905 —

Have just tried Conc Nitrate Ni in Ammonia — on evaporating that Ammonia $Ni(OH)_2$ will come down — leaving Nitrate Ammonium Solution — which evap to dry. Thin leaving on water the Nitrate Ammonia dissolves out & fresh dose can be put on sponge.

Jwa reports that he can get more $Ni(OH)_2$ in the Ammonia by using pressure. Comelly use need a 3 to 5% Sol instead of 1½% to reduce the labor of dipping —

I have exput going of 1½% Sol of $Ni(OH)_2$ in Nitrate + with quicklime to absorb the water & thus Concentrate the Solution.

It does it ok - but the lime dissolves (?) in Good - best will be Barium Hydrate. Then HzSO4 to take it out

Mch 24 1905

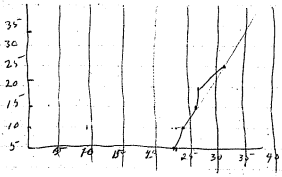
By putting sponge grids in Vac T
Chem running in normally N.O#4
The patriachs got on. Then way a
large quantity N.O# got in
two different directions. Effected
one — only damaged in Chat in
Drying the Contraction many
Full Welded flakes apart,

New process crossed Iron is
Sulphate fe in fused mixture R#,
Then (washed) dried, reduced in H,
with Buffer vapour CP H. prepared

Also Sulfate fe ignited Then
fused. N.O#,

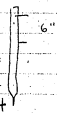
Also Sulfate fe ignited exactly

Sulphate dissolved with My Comb —
& Reacted — Then (washed



March 25 1905

Determined the Viscosity of KOH NaOH. diff %



KOH

33%	32 min	48 sec to run out
21	26 "	51 " "
15	26	8
10	23	53
5	23	30

NaOH

33%	129 min	3 seconds
21	72	37
15	41	6
10	30	38
5	26	18

10% KOH 5% Lithium

15	43	—

from this it would appear that 10% would give least swell but probably 21 is Great

March 28 1905

12 Pockets felted with cobalt flake screened through 40 mesh then treated with hydrogen 750 mil grams to a cobalt

# 9106 =	11.779 —	Wt. before diffing
		Wt. after diffing
9107 =	11,851	
9108 =	11.089 — gum	
9109 =	11.849	
9110 =	11.674	after 2 dips from NaOH 1:04H bisulfite
9111 =	11.570 —	2 dips after water rinsing ignited = 1055 mil g 4 dips no reference 1074
9112 =	11.377 gum 908 —	
9113 =	11.956 " 954	
9114 =	11.802 " 888	
9115 =	11.378 989	

over

These are grids of N°
2 Edison

9/16 11.909-1.021 ~~plot before clipping~~

9/17 11.782 997- grid of no 2

average 959 Edens

(FT)

Mch 29: 1905

So far have 62 dips on the 5 packets with Cobalt sponge welded.

I start 5 on dipping in Conc $NaCl_2 \times H_2O$, 1st dip dried in Vacuum Dryer - Considerable oozed out on 2 of them at ends. The holes of all mostly closed. Think 2nd dips will not be good as residue skin may not be permeable at all egress closed muscle - Nearly have to use only one dip for Chloride before doing KOH with Sulfate Ni. It will be difficult it dont have viscosity to close up everything. possibly Chloride Cobalt be worked cold in Vac Dryer but I doubt it —

1st series 2 dips done
2nd 2 dips done
3rd series 2 dips Dipped 1115 a
Dipped 1 pm
KOH 230, in water 345
Changed water 545 —
out while 650 pm —
at 7 o'clock put away for night
in morning put on asbestos, then
paper above is 6 dips of 2 each
after KOH + dead dry
9110 gained 1.384. —
9111 " 1.506
They appear slightly oversized but not certain.
Caliper 92 — 92.95
96 92.97
ones not treated 4th 59 — 91.90
Dipped 910 am — only 1 dip three series —
off + in KOH 1215 pm — in water 1240
only 20 minutes in 3% KOH.
after washing + drying No 9107 increased
from 11881 orig 13794 a Total
gain of 1.939. Bent appears to be
lowered — slight irregularities
9111 — orig 11578 — Now 13 368 gain total 1810
or 304 in last dip.

No 1 Chloride Conc
dipped slowly — dried 1½ hrs
Vac dryer, then left in all night
hot, then dipped + air dried
about hour, then put in 33%
for 1½ hours, only trace of varnish
out, took out KOH, 1230 PM — Neck 29
put in water on hooks
Notice that there is a lot of
Copper in solution, and this
would poss Knock the test out
am going to start No 3 set
with $NaCl_2$ free of Copper —
No 1 + 2 will be bad from Copper
but will show as to best
method of dipping —
Changed water 4 pm — to 510 PM
No 9111 — gained on the Two dips
655 milgms after 2 dips KOH + soaking
in water 3 times as above
Put away for the night 715 —
Put it on dry yer for hours Tomorrow
30th on Dryer 8.30 am, ripped 9 am —
on dryer 905 am — dipped at 1150 am
put on dryer — KOH at 215 pm —
in water 345 pm — Chgd H_2O at 610, changed
water Wednesday at 855 — Dryer 930 —

(65)

9111 hum 1.585
9110 1.646
9106 1.957

No 1 Continued, make 1 dip more
dates on 3 of them then on other
3, put after 1st dip put in KOH
hot wash or dip once more
KOH + hot KOH 1 wash dry + boil,
in KOH 635 pm [illegible]
dipped all - then KOH, water + dried
3 taken out for test.
The other 3 dipped + put in KOH
at 120 pm = dried +
dipped out 5 25 pm (this is
the Month dip)
left in NaCl until 5 pm next day
545 -
Not dry yet put out away -
dry in morning.
Dried, put in hot 33%. Dust at
230 pm in cupboard
Drying at 545 - [illegible]
Dry + dry [illegible]
No 9109 - gram 2.011
9107 2.219
9108 2.221

Dipped 810 - out 840. + on Dryer
leave all night up higher put on low in
morning

April 3rd 1905

No 1 in water 145 - last -
thumping - as 1st 3 swelled + slight
cracked + swell has caused flake to
separate from cup sides - am going
to plate the flake together to cup
by Electrolytic + then used, in addition
we now have corrugated cups

No 2 = 1st run —

	Vact	to 50
9162	67	68
9117	133	171
9116	167	171
15	176	183
14	131	132
13	175	181
12	126	127
	2nd Run	
	160	163
	192	193
Equivalent to 475 for Req	195	198
	163	167
	195	197
	165	172

2nd

No 2 Cards put in KOH at — 5.45 pm — put in water at 7 pm. Immersing [illegible] No 2 at 8.30 am — 3 dips after Yesterday

3 dips —

Note: No 2 on the 3rd dipping have certainly swelled very much — disrupted the welded [illegible] has a bad but I think, that 3 dips are too much for the 2nd section — probably Solution classed not be so syrupy — it also grants to Alcohol Solution on a first so it runs, dry grease — There is going to be trouble much Equity to avoid this Swing — perhaps we must alter weld Collar, has the welding of No 2 made it so high temp as we have it — We found out more people As the pockets are swelled very I bring them ready to a Coil in 21% + then put in Water + then ready to go on Run after Brushing + drying + Taking of weight previously Drawn

see page back

given to Lows to Run — all washed etched

Gum recorded under Calipers

No 2 Chloride, same Conc Solns

No 1 — dipped slow on Dried 1½ hours, redipped 12.30 pm Mch 29th allowed slow in Solution 10 minutes on dryer plate, 12.45 pm — off dryer 2.10 pm — Dipped again at 2.18 pm — on dryer 2.25 pm —

off Dryer 4.05 — 4.10 pm put in 33% — took out of KOH at 5.10 pm put in water on heater

when put in KOH, from aqueous out more than No 1 — it was not all over one or two spots on one 3. had none against out, I think that of stuff in [illegible] even that 3 dips is OK — although it might possibly be better to not run. NOT to go strong in solution for it acts poor for Capillarity not running upwards at all a powder Coy at when Trap late air + Gr very unevenly filled —

Put it away for the night in Glass water beside the No after 30th in Dryer

8.30 am — dipped at 10.45 + put on Dryer dipped at 2.15 + put on dryer, dipped at 4.35 pm

29th.

No 3 dipped + put in KOH 5.55 pm 29th
2nd dip in drops at 7.05 pm 29th =
put them away for the night at
7.15 – put them in KOH + in evening
for 1½ hours, on Dryer 8.30 am 30th
dipped 9.55 am
Put in KOH. 11.55 am – much whiff outside –
in water 2.10 pm
3 dips out + fresh ones on drying
at 5.16 pm – to a yellow tinge

2nd series – dipped at 1.56 put on Dryer –
Dipped 11.20 – at 12.55 put in KOH.
9 dried then 5 mm in paper on plate
put in water at 2.15 rather than it
has swelled in Carbon. –
Changed water 5.45
On Dryer 6.50 – in evening put on cobalt
chem paper
9154 gain .627 9156 gain .702

3rd series –
Dipped 10.30 am
" 12.30 pm
in KOH. 2.25 pm –
Dry weight 9156 orig 1.937 now 1.3270
Total gain 1.333.

March. 29, 05.

Grids filled with .0002 cobalt.
plate treated with H hydrogen.
2nd lot. 7 full reg. yellow heat.

	9154 – 9160 incl. 2nd lot	7 full reg yellow heat	
*	9154	11.800	dk. before cliffing
	9155	11.898	
	9156	11.937	Daylight 5 minutes for Copper
	9157	11.970	
	9158	11.481	
	9159	11.577	
	9160	11.923	

Series Dipped at 6.05 pm – dried + put on
shelf for night – only 4 left,
in KOH – 9.55 am dry – put in water –
dry – 9155 gained 1.522 – now dip.
at 2.55 – dried KOH hour then
at 6 pm in water –
Put away in water, plunge in water
in morning

power

9D

No 4 dipped – put on Dryer 650 pm 29th – put them away for the night at 725 – put them on heaters in morning for 1 hour – on dryer 830 am 30th Redipped 912 & put on heaters Redipped 12 noon – Redipped 230 pm

~~Redipped 530 pm~~

at 535 pm – in water ready at 7 pm Changed Bath at 530

2nd Series

Dipped 1130 am –
" 105 pm –
in KOH at 205 pm – in water 345 pm – Chgd water 545 on Dryer 650 put in mng put on asbestos then paper

~~No 9149 gms 999~~
9148 gms 919 mlg –
9145 " 1.117

3rd Series 7 dips

Dipped at 945 am –
" 11.75 pm
in KOH. 225 pm
washed, ~~dried~~ dried.
On shelf for night. 1.694

1st lot about right decat

#			
	9145	11.279	wt. before diffing
	9146	12.094	
	9147	11.735	Sulphuric Dregs Copper Solution
	9148	12.105	
	9149	11.733	
	9150	11.420	
	9151	11.800	

Sunday – Dipped 957 am – KOH at 1255 pm – washed in Dryer at 345 – put away for night Dried – Dipped 1820 am – wt Solution 835, Dry 205 pm KOH at 215 – had in 3 hours then Washed & Dried all night. No 9149 gms 1.677 – all those of No 4 are swelled – No use going further flake appeared on both sides of each with in 30%

[93]

31 March 1905

Dry hydrated $MnCl_2$ dissolves pretty fair — Ethyl alcohol it sticks very hard on drying & no gummi — Thus obtained work fine for dipping & protecting as must the alcohol being condensed & saved as it would work more roped Carriget — about 320 mil. per dip — Wilsed how solve 66° adapter Chloride in —

March 31 1905
Grids filled with cobalt 750 deg. F
heated H gdrogen
3rd Sat Bright heal (Low white)
905.7 11.820 gamm after Kohlrausch 385

9.142 11.745

9143 11.752 gamm after Kohlrausch 493

9144 11.636

9152 11.827 gamm 630.

9153

Dips to be 1st

gain in weight NiOH, 1st 6 dips
only average 171 milgms
This shows that it showed
require 15 series of 6 dips
each —
better make it 6 dips on 2nd
2nd —

Dipped 1158 am — 3 owners-end of August
" 1215 — 2 put them right on Mon
" 1245 — 2 report on health for 2 or 3
" 140 — " months
" 220
" 305 — 6 dips "

off the abs. 350. well drained in KOH 358 pm —
in water at 455 pm —
on Bryn 650 — in morning put on asbestos
then 4 pm —
Bottom 3 samples duplicates. 3rd Series —

1st dip	820 am —	in KOH 410 pm —
2 "	930	dipped duplicate lines
3	1110	dipped 615
4	1240	set on shelf for night
5	2 pm —	Next
6	3 pm	

The little marked 2 to catch the last
grain dust small weight, gentle rolling

No 5 — 9142 9087. 9143 9152 9144
$MiCl_2$ in ethyl alcohol —
1st dip at 350 pm — wet 31 — 2 Dipped)
4 pm — 3 dipped 4 pm — 422 pm —
runs and in — put promptly in 2 of them
probably heat too strong —
Last 4 dips — dipped 438 pm —
dipped 450, dipped 512 — 6 dips
4 pm — [illegible]
in KOH at 535 pm — Changed water at
830, Dry 930 —
~~Dip 2nd~~
~~2nd series of dips~~
~~10 Dip 2nd series~~ —
4th series
Sunday dipped 950 am — dipped 1040 am
Dipped 1115, Put in KOH at 1230 pm —
on 17th dip after KOH + water 9142
gained 660 milgms —
39 Mult to dip —
notice buckling — from now on well
use methyl alcohol Sol of $MiCl_2$ aq —
4 dips each —
5th Series —
Dipped Methyl 410 — Dried put away
for night in KOH then rinsed 810 am Dec

in hot KOH 33 flow

No 5 in water 2.35 pm - dried -
weighed 9143 gained 768 to date
~~soaking~~ Dipped 940 - out of liquid 1005 -
on Dryer in KOH 33% hot 8.25 pm
only one dipped about hour & a half
Water at 3.45 pm - out + drying at
6.55 pm - Dip in morning again
Left on Thursday 8.55 -
Dipped 10.45 a.m. - dry at -
Dipped again a.m. in KOH washing 9.20 am
in water 7.25 pm tomorrow
Take out weighed dry -
on Drying 9.25 am ~~Dipped~~
Dipped 9 am -

grid No 9159 31 March 1905 - No 6

Try to shake 200 mesh dry $NaOH_2$
into sponge pocket,
Original wt pkt 11577 -
after screening on 200 11728
~~After~~
After some worked in
Mushy alcohol 12 075
a gain 498 milgms -

We made a mush of 200 mesh
in alcohol put grid in
Vac + then let mush up
into Vacuum -
Weight after drying -
12078
No gain
We next move it up + down
many times in mushy $NaOH_2$
in alcohol -
after test weight 12 485 -

A total in all operations
of 808 milgms -
did some mushy again
Weight 12 659
a gain total 1.082
0002

[101]

200 mesh expmt Cont'd

Dipped it in new strong $MnCl_2$ in 95% good alcohol — dried on asbestos on platti — after drying weight 12.784 These expmts on 9 hrs = in morning go ahead dipping Reg way 6 dips before KOH. - 7.55 am dipped making 2nd dip 8.25 3rd dip 4th dip 9.45 — 5 dip 11.15 - 6th dip 12.20 pm

in KOH at 12.58 pm - in water 1.40 pm dried + weighed 3.25 pm

weight	13.092
gain total	1.515 or .308 mily

for 6 dips in Alcoholic $MnCl_2$ agt or 50 per dip —

2nd series 4 dips —

Dipped 3.25 pm
" 4.40 "
5.20
6.10 KOH at 6.35 pm —

Water at 6.50 - put on sheff for night.
Dipped 11.11 —
in KOH, 2.40 pm -
Dried — gain so far 1.683.
Dipped 8.40 am

230 pm dipped the tanks in Chl. N. ag Conc
445 put in warm 33%

Try open end (2) one end pack with felt - world in Hydrogenous thou Shake in 100 mesh stuff till full then put in grid close end - then formed by filling in Coal by dipping process which will serve also to lock the 100 mesh stuff in -
Can tell by the weight how full it gets of 100 mesh.

May 17. 1905 - 513

Recorded in wrong place in Book

It would seem that 33⅓ swells very much more than in 21 & that this swelling probably affords space for plenty KOH, so that no charge can have plenty KOH. The defect is that in flat pocket the swell continues to load a gun ultimately got too much tube — if it stood & stopped swelling after the best cartridges were obtained it would be fine. Now I've an idea that we can do them with the tube pocket by loading it oval for then the action of the current & KOH will swell it to round where it will cease — by using the right oval the exact point of best swell can be obtained.

Can load oval as the cases loading tubes in stamp mill & perhaps can have their molds made oval & the tamping rod can be made of the same shape.

Possibly the right degree of pressure in tamping is important

New lot 10 pockets Cobalt flake about 790 milgms, lamped + welded at whitish yellow - a temp higher than ever before - grid stuck together quite strong - a glassy polish - Cut and formed flakes OK =

9163 = 12 440

9164 12 148

9165 11 241

9166 11 345

9167 11 898

No 7

9168 11 402

9169 11 425

9170 11 583

9171 11 950

9172 11 616-

No 7

Methyl Alcohol. Merck Reagt – Saturated with $NaCl_2$ agt

First

Dipped 940 Sunday – 520 milg 1st dip before KOH. 2nd dip 1150 am. ~~KOH~~ KOH at 1 pm – in water 110 pm – Dried – 9164 gained 422 milgms – or 210 milg per dip –

Second

Dipped 425 pm – dried & put away for night.

Dipped 827 am – out of Soln 840, Dry 2 pm ~~KOH~~ KOH 215 pm last, in water 6 o'clock, – out drying 810 – Thursday weighed 9967 – 12 710 – gains 812 milgms 4 Dips – or 203 per dip –

Third

Dipped 915 on heat 928 – am –

Dipped 135 pm – 10 mm in Soln – on dryer 145 – at 345 put Crist on plate it was on table from 145 to 345 pm –

KOH d 650 – out in many in H_2O 855 am

(113)

No 9164 gm } 1.182 - Dipped 920 am →
in Solution till 220 pm now on a half →
in KOH 925 am in water 9 am →

No 8 -

Concentd $NiCl_2$ aqf -

First.

Dipped 9.46 am Sunday – put in KOH 11.40 – in water 12 Noon – Notice when put in water separates a little – (Next group dry with KOH in gently –) not long enough in KOH for chloride should have 3/4 to 1 hour at 1.20 pm put it back in KOH & go to dinner out of KOH 2.40 & in with – on drying 4.50 – dried put away for night gained 475 mlg 1st dip –

Second dip 8.17 am – 12 noon dry KOH at 12.08 pm – hot, in water 6 pm – on drying 8.20 pm 1 hr in morning No 9 & 1 weighed 12.620, a gain 670 ma or 335 per dip – out began drying 9.45 – in KOH 1.30 – in water 3.45 – on drying 7.57 pm Dip in morning – put flat on 355

Dipped 10.45 am in KOH, next morning 9.20 am in water 2.20 pm – Tomorrow morning take out H_2O & dry on drying 9.25 am –

CVR

Dipped 9 am -

May 16 1905

Obs 218 288 Cups Surface 864
Millim 8 Mills -
New Tube Cell 6 M 672 192 Tubes.
602 Million Sqr Mills -
or Tube cell has 70% of the Nickel
Surface of old Cell -
Tube cell has 1415 grms material in
tubes of which 990 is green Ni hydrox
Old Cell has 737 grms material
of which 589 is green Ni Hydrox
or 60% of what is in Tube Cell -
In tube cell as it starts from
the pocket it has 80% of its
active material in as good position
as in old C Cell,
Weight of Tube Cell over old
Cell - 1.75 of a pound -

[171]

No 9 = dipped in Conc $MnCl_2$ aq
then right in 33% - 2 minutes in
33% then in water - 8 minutes
then while wet put in Conc $MnCl_2$
again for 5 minutes - then in
33% KOH, mmmy - 4 mins in 33%
then in water - 5 min in $MnCl_2$ aq
at 515 - at 520 in KOH, 33% -
in water 531 -

April 5 1905

N010 Conc $NiCl_2$

Corrugated pockets clinched at 4 Corners. packed with .0002 Cobalt flake by plating. 780 milgms — Welded in Hydrogen whitish yellow opened one found it welded OK -

9196 9183 9176 9175

12324.1st

9177

$NiCl_2$ as

To be dipped Twice in ~~Methyl~~ Glycerol Solution of $NiCl_2$ - Dried 4" away from plate — gradually brought down to plate itself - Then KOH. 33% hot. Wash + dry -

First

Dipped 530 pm - on drying - it will not stand in 4 inches away. must be air dried until most methyl off before going on heat, I set it up on shelf all night on frame put flat at 855 am - in KOH 1040 am + in water 645 pm -

930 am Changed H2O

(131)

on Dryer 220 pm –
Dry in morning 2nd dip
Dipped 9:10 am – dipped in Conc HCl –
by Nikki Ike – Dry 9:20 am

Methyl

No 11 — Methyl

To 6z dipped ~~once~~ in Conc $MgCl_2$
+ then KOH —

9189 - 9191 - 9178 - 9194 - 9179

First.

Dipped 550 PM - put on shelf - on frame
all night over plate — now flat 8 55 am
in KOH at 1040 am - in water 645 pm
920 am dump H_2O on dryer 220 pm
Dep in morning - dipped 910 am
in Methyl by mistake, hereafter Kerosene
Drying 920

SR April 12 1905

Downstairs—

Experiments in plating on rather fine wire 1/4 inch tubes made by plating from the Sulphate—

3 gm—Double chloride Nickel + Ammonium Sulphate + Nickel Oxide hydrate—Nickel Rod Tube in tubes, 1st Zinc Coated, 600 milliamps 3 volts—Nickel plated OK—closed the tubes—

Another 8.56 (clockwise) 1/2 amp—Nickel

(Wire red) Special Heavy Copper 517 gm—in NH_4Cl NH_4 H_2O_2 good but long need—Can not thick enough—

Another 544—Thicker Copper used H_2O_2 in Solution—Before putting Cathode in—good deposit by used but not—Correct appearance under Tension by H_2O_2 in Copper Solution—

April 13 1905

Have plated a 1/4 inch polished Nickel rod with Copper. The acid is pulling the Copper to free it from material for will use these Cu plated tubes to plate nickel on & dissolve out Copper by O_2 + acid or NH_4OH + H_2O_2

Have just found that rods of platinum prove practical plated electrolytically will on trying & heating the Copper shrinks & let the Copper come free possibly can plate the Nickel on direct & get it off & thus avoid pounded Chalk with a trouble crucible plumbago plated & acid soak dissolve out chalk pure Portland Cement dills —

145

apl 13 1905

Lamotte making split mould to hold plaster paris rods

possibly a mixture of 1/3 or 1/2 of Chalk & plaster paris will set ok & be strong enough & thus would go to pieces in acids-

am taking out Cop by KOH, Iodine & [illegible] works ok -

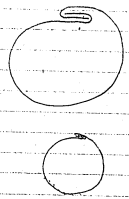
By plating a little, amalgam putting in water & pulling back dont crack in $NiCl$ NH_4 — Especially if piece placed Zinc & allowed Zn to be reduced by liquid without contact

Reduced Cop Tubes in Hydrogen Contraction busted it - This problem is Hell -

April-15-1904

Have just made a lap tube
thus which form experiment
on tapes made well
probably stand 4000 pressure
(4 tapes supported hard
Hope strong tubes

(pressure)



Tried to make a test cell with
three lap tubes, we use Reg perfd
block + lap when tested and no
perfns - Well use Reg Mix
+ Rem — 33½ KOH sat'd Ca(OH)₂
33 well use 33 NaOH
+ stand — dens 40% KOH
+ plumbago Use
— going to bend it in Hydrogen

[49]

April 15 1905

Have at last succeeded in forming a tube of Nickel by electrolysis from Double Sulphate of Nickel & Ammonium but not 80 Cent Strength then rolling to enlarge tube & pulling off — at last there is some hope — cannot be made Comel S.S. — Density 1 amp per inch now working another to the density — When we know how deposit must be the great tension that Co or Ni stand running at 6 volts only to find out the reason

It is essential to heat the deposit to get best results in rolling it to get it off Nickel but if deposit is Co is fully done — Electrode clean It is OK anyway The Nickel should be hard. Am trying one of Kahlenberg's Stirrers Electrode cleaned on

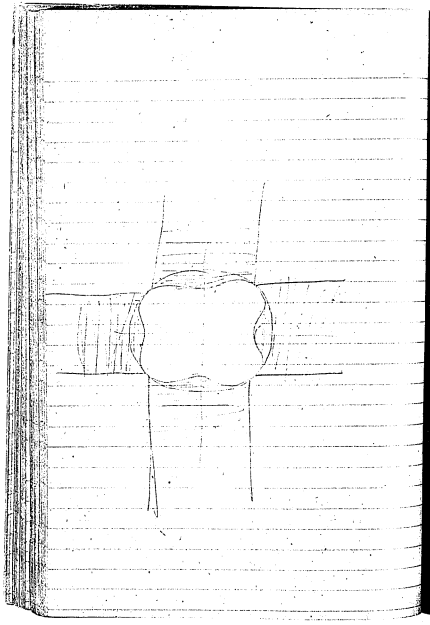
April 15 1907 8/13

a Cathode — KOH with
great Current density
also going try Copper on
positive Iron

Now going try how high he
can heat half of loop
tubes in the before there is any
melting then use same
Keep below this heat &
cooled the loop to the greatest
Extent possible —

It is probable that tube
.003 X 250/1000 4½" long
Can be spun by 3 coupled
at slight angle or loops
with or without of a mandrel

Rogers is going to try
it



Apl 15 1905 518

Corruptions

4

Lap

Lap

153

April 15. 1905 513

Having trouble get more
off Cu rolling it on the
[illegible] — have re-
[illegible] [illegible]
to stick —

Have placed a Nickel
Mixture with Caffein
& will place remainder
this a.m. —
650 amp. 1 hour 7½@80
Cent. Deus Sulf Ferrite —
beautifully plated —
& not brittle. Must have
to heat it —

April 16 1905

Find that cleaning Mixed in
KOH bath Carbide deposit
the big for cleaning & dirty
the deposit right —
The Nil Electrode with
indentation made by

April 16 1905 SB

pressing wheel with teeth on it running it like Cutter Scraps & fillings with copper Varnish + Backing + then cleaning surface OK — Blue Cad. it with Copper then plated with Iron at 80 C. Holes OK Etching and Copper by Cyanide in KOH + Citrate

Think this Method Can be made Comm'l —

The KOH Citrate or Tartrate The Using brass an anode Iron is first attacked

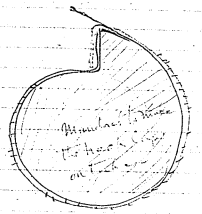
If Zinc is used it must be polished after plating

Am trying Conc Double Chloride Fe + Ni + 4 at 80 C

Also Double Chl Ni + Ni + 4 80 C, 1/2 amp on 2"

(155)

April 16. 1905 503



As the shroud off mandrel it goes with a rush mandrel stopped above bent over & makes the break

April - 16 1905

Thin is good - instead of the usual Double Sulphide of Nitrobenz hat 80 C. the plates are unfamiliarly Becker in Exact perfect in Core Double Chloride of Nitrobenz 80 C. I guess that I subscribe heat for in Bright is due to removal of Naphthalene at the surface hence plates in opals, Coherence with plating of Naphthalene - Heat to give apparent value by 2 mm (or) Cu. Cu Calm Naphthalene only. Wash perfect plating Chinese Exact density + Stick to heat the sulphuret - No cracking - Thank Double Chloride of Tx + May be good in now beginning at 0

Apl 17 1905

Spiegel tubes — mandrel filled with Carborundum dissolved in Pyridine — dried 300 — (Cleaned) put in KCl to Calibrate 1 Cl Cam — in Copper Voltameter 138 pm — 400 mil amp — off 148 — in Mc Sol Chl Hg Hg 80 cent. in 150 pm — 550 mil amp — (550) off at 4 o'clock put in water Came out nearly towards end but major part OK — Holes nearly Lee Closed

Cam trying solid mandrel No holes Copper 20 minutes 400 mil amp — in Mc Cl Hg Hg 80 C sol 440 pm to Go placed 2 hours at 500 mil amp —

Have fried Rall this in Ammonia

(165)

April 15 1905

Are trying to bring an old test socket back to being usable by soaking it free of [illegible] in hot water then drying and soaking in [illegible] [illegible] solution. then putting it suddenly in salt with very little solution in & [illegible] heavy current at [illegible] to melt all the graphite —

Also going to change [illegible] [illegible] [illegible] [illegible] the idea being [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] as well as [illegible] [illegible] [illegible] [illegible] [illegible] bring [illegible] back [illegible].

Sept 18 1907

From the Feat. of Ores
Colorado ... 28929
it would appear that nickel
alloyed with Cobalt is
even better for preparing Cobalt
from Sperrylite (Platinum
Nickel + that it can be
used for making plate

Have ... ore ...
... Co ...
... Co ...

Penn Co 27 wee work
by this Cu 75 parts Ni 5 pts -
also Co in place Ni -

May 2 1905

At last I have got a good process for making Co + Co Ni Comedy flake

1st Experiment - Fuse Monosulphide of Platinum then add dectate Co Salt after Co acetic decomposed add Sulphur heat till clear fusion cool slowly let the Sesquisulphide Co crystallize it Crystallizes in graphitic Leaflets - + like the Co Cl only it can be roasted to an oxide without loosing shape + then is reduced by Hydrogen OK -

Can determine proportions for best yield + also best for Co Ni alloy flake

[PTO]

May 2 1905

Used porcelain crucible - Can use large Hessian crucible in 2d or 3d lots - everything else is carried out by working Except the fluke —

May 15 1905

SB
film.

Copper Nickel Mica

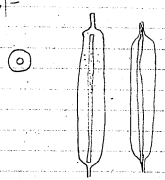
Note
Cuprous Antimonate.
$3Cu_2O\ Sb_2O_3$ not attacked by any acid Except long boiling HCl.

Nickelferous
$(7CuO\ 5NiO)\ Sb_2O_3$?
all thin laminæ 6 sided (with dont say how make it 6 sided by formation of wafer
poke fuming $CuO.Sb_2O_3$ = Copper
Crystallized Easily out Copper
by HNO_3 —

May 17 1905 -

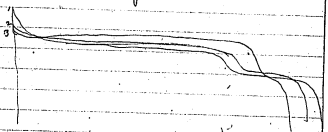
Warren is making flinks 0001 of Cu Co. Cu Ni. Ag Cu Ag Co Ag Ni, Bi Cu Bi Ni Bi Co Cd Co. Cd Ni + others for test purposes in tubes — plating process —

In tubes try an inner tube with some holes in to afford a supply KOH or Cl, & also act as gas emitter to give gas pressure Try one unconnected at connected electrically — also non inflatable T about 1/16 -



June 6th 1905 SB

It is curious that runs run on hot test 130° Fahr with Reg. Ni – (12) 4 Ni + 1 Iron after 44 runs when run on Cold Coil the Capacity is showed higher + every run showed higher + better V-charge.



+ lower initial Voltage - Noticed that when Come off hot test grid all volts from Hg glass Cell

Also noticed a bulky hair crystals deposits on charged Iron. so large that one would think it was Crown the Electrodes Took Some out, showed crystals

June 6 1905 5B

24 flowsheet appeared to me just like Lead deposit gutta says has little Hg little Fe. Appears to be mostly lead although he is not sure Cerussite - the amount of bulk on 1 mm pocket varied to 1/2" Cubes - possibly it the operation of the KOH upon Silvers make allocation that Lead Sulfide + running back - possible Lead exists as a Calcium compound to the mentto increase the Capacity - Dr Quin from the mitchell Vablan 7½ on deck after 3rd run it showed a very Economical on Chg - Can't be that there is something that Comes out of now or that hydrate are made anhy + Acetone by heat in KOH. The fact that boiling Ry Wtr 7½ in water makes it a better Capacity

BD

June 6 1905 SB

Either how to do with dissolving out some dehydrated Oxide or the hydrated now is made semi or full anhydrous & irreducible to metal by Current — Am going to make an electrolytic test on Iron after it Nickel purified & see for

Later Iron has analyzed the deposit & finds it
62.5% Lead
16.6% Iron
20.9% Mercury —
it therefore down from the Oxides —

Swelled after 15 Runs 4/1000 in Center, 11/1000 on Edges

0021

[153]

We have now put 6 nickel packs with one new + changed the KOH for fresh KOH

Told Young man to save the old KOH + clean the pocket of the P67 Hg deposit

Millers Samples. Ni Co, Parry Sound dist 271 Cancombe Ni & Nickel in little Co Good deal of Copper

375 Smaller very little Cop Ni & Co Mtly only tinted

377 = Big Copper Bubbly Ni Co

379 Copper

Mullen

364 - Copper Developed Ni & Co -

Specimens were done with Mully
Cast iron above Cyanogen
Thumbtail Ing -

378 Mullen This has Cobalt
only no Copper or Ni -

367 Mullen Big Copper No Ni or Co

368 Mullen No Cop Ni or Co

373 Mullen - Some Ni Thumb Cast Mullen Copper

376 – Nickel – little Copper –
Considerable nickel – Don't seem
to be any Co –

375 No Co –

353 – Com. in cobble Cobalt,

354 – Big lots Cobalt,

358 No Cobalt to or Cu

351 Big ~~Copper~~ Nickel pply some Co –

349 Big Cobalt. pply some nickel

[R9]

362 Some Copper - a little
Nickel - possibly Little Co

370 - Nothing -

369 Nothing - except possibly Some
Cobalt -

374 Nothing
Something Showing about this
one with Nickel & Glass containing
some Other Elements -

365 only Copper -

361 Little Copper -

360 Trace Cop ~~[illegible]~~

372 on Copper Ridge heat
Big Copper Rock Co's
Have found Cobalt.

366 - Dusky Andesite
over Copper approach

379 no nickel or Cobalt
Little Cop -

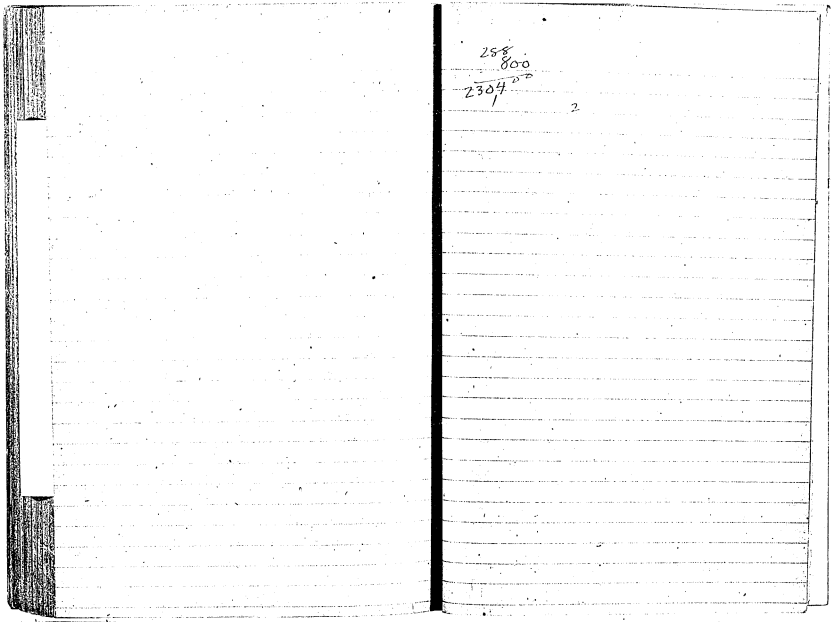
June 16 1905

It Looks very much as if the green granules of $Ni(OH)_2$ when Covered with feldike $NiCo_3$ or other flaky Paint — Lutum & finished hard only make Contact at points & when discharged the moment the point is discharged as it no longer is a Conductor the Coherence of the granule all but Cleaves & discharge Capacity is diminished Volume increased after the tube is loaded & charged & producing out if used then dried & and solution that will slightly dissolve the surface of the granules & before the solution can diffuse out to put in Ref Carbol + H_2SO_4 this will make a layer connecting the granules better with the Conducting film

(195)

June 16 1905 SR

Another way is to act on the surfaces left by the granules by a Solution of the reduced of which combines with the $Na(OH)_2$ wash out solution & treat with KOH not to decompose the salt of Na + this will give a lower back of staff-connected to the scales granules of fuse—


258
800
2304
2

1 ft 10 000 times per 80 Lbs - 0002

12 inch cylinder - 2 ft long
is 6 ft.

6 / 10000 — 1666 — times —

20 Cylinders / 1666 (83 times.

40 Cylinders / 1666 (41 times —

Say 40 Cylinders 1 X 2

40 dips —

1st dip 10 sec 20 in 20 out 10 thro
Making Zn 1 min —
Weight 1 min — Nickel 3 min
acid 5 min — Wash 1 min
Say 15 minutes,
4 dips hour or 80 dips —
Therefore 20 cylinders will do

2 men to gang - 18 sq ft — in
on one rod —

8 men Day 8 mnts.
16 mnt 160

80) 1280 (32 Cents Labor

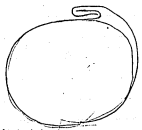
Think Can put double rod &
20 on following Labor to
16 cents,
probably 4 Extra men to
Clean - gutters 20

Say 25 Cents. 80 for acid
Total 115 Say 125
1/2 Lbs 65 cents — for 18 —

40.66 -

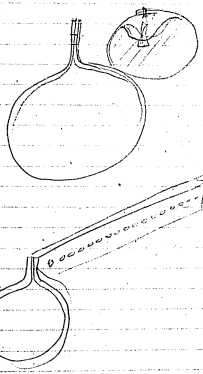
1000 -

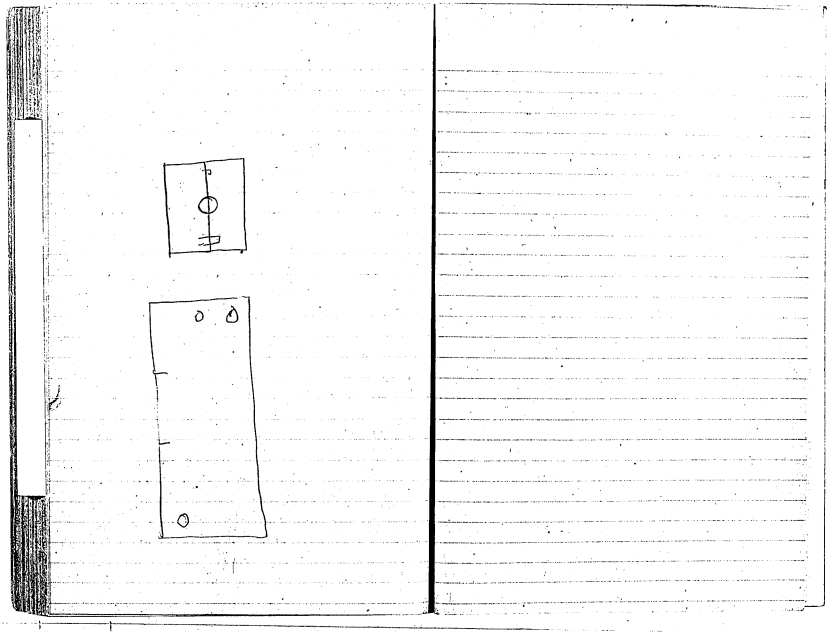
35 | 1440 lbs

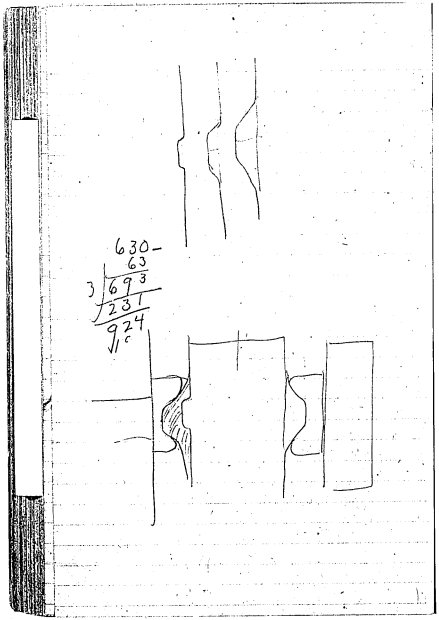


1 ft 10 cm times

3 ft







630-
63
3 | 693
231
924
11c

100 — 15
200 00 75
400 00 375

2 1/2"

.015 —
1 013
2 .011
3 — 009
4 .009
5 — .007
6 — 06
7 — 05
8 — 04
9 — 03
6 — 035
7

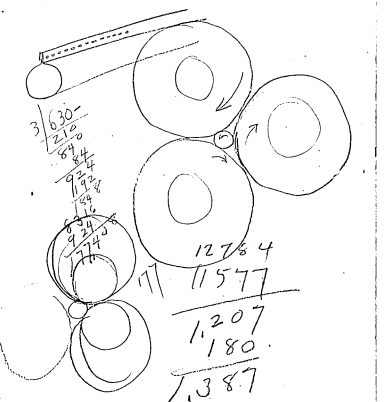
200 min —
3

1200 mlq 100 —

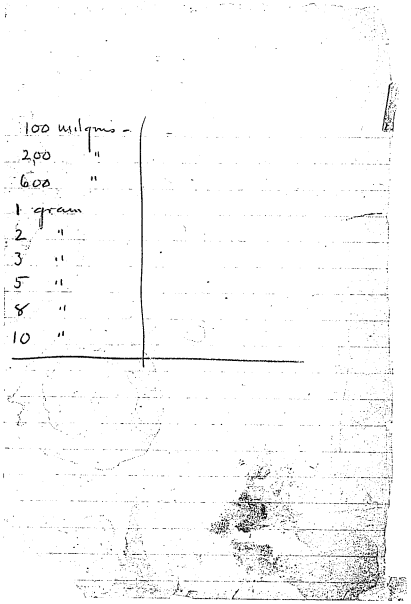
5 days

120 cc 7 9 5 5 —

5 days 300 min —
soak — 300
60
360

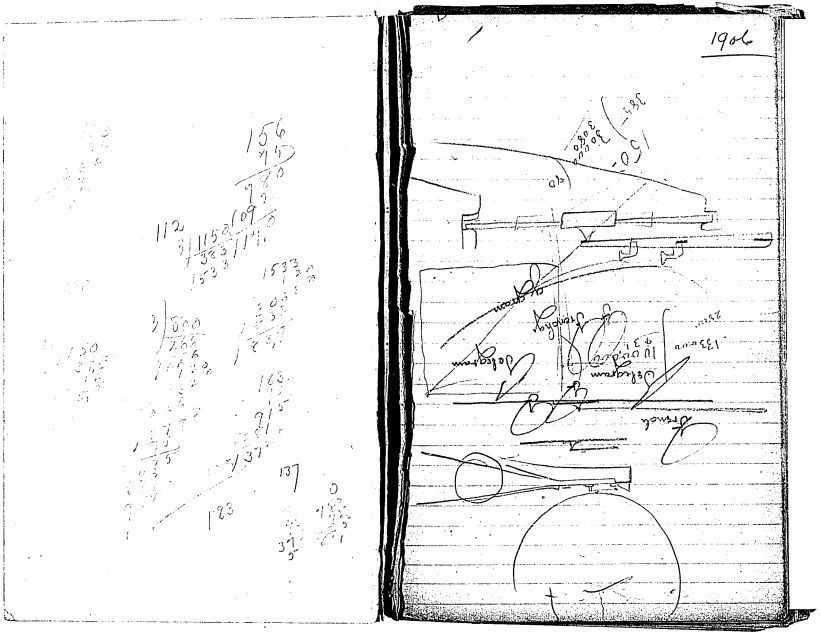


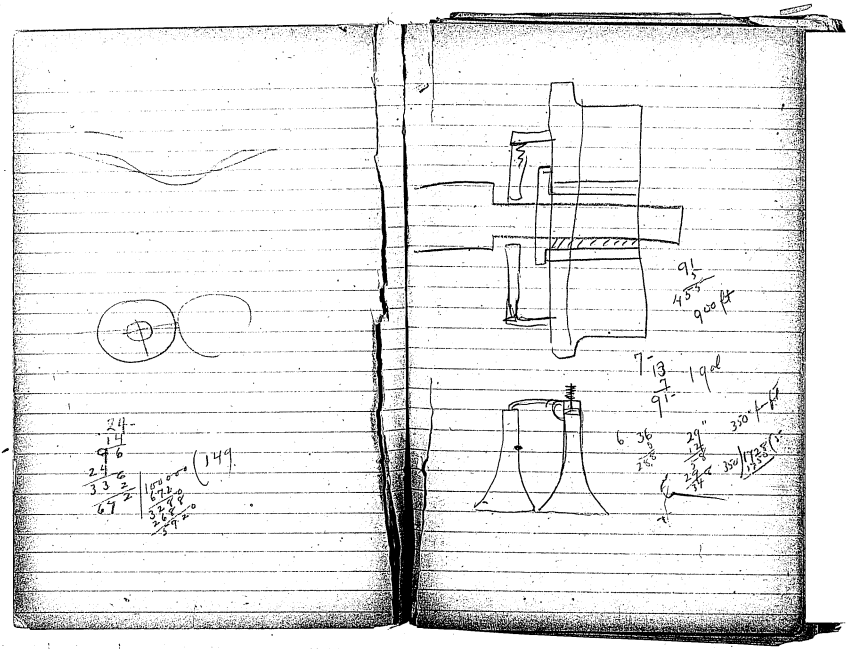
[ITEM FOUND IN BOOK]

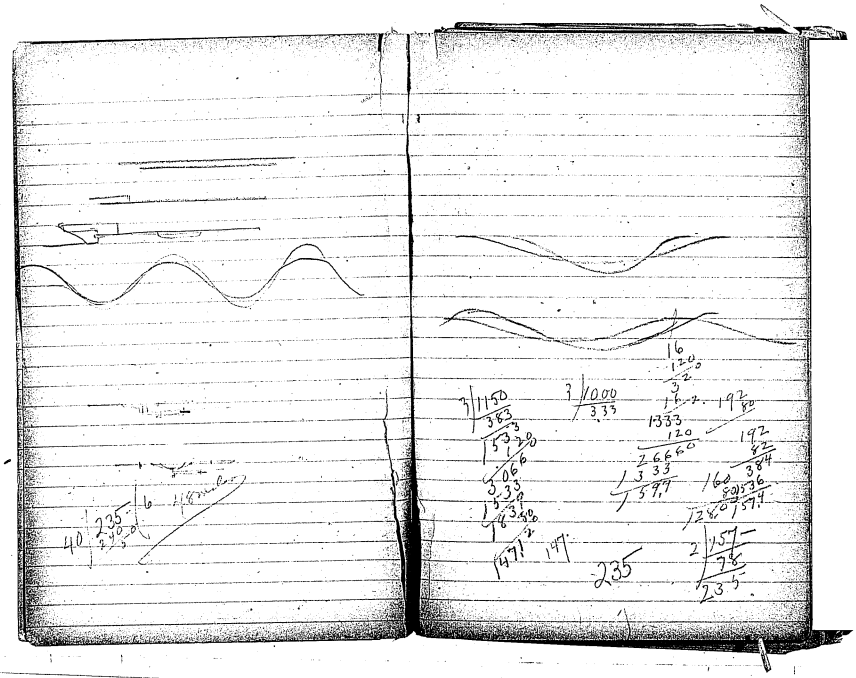


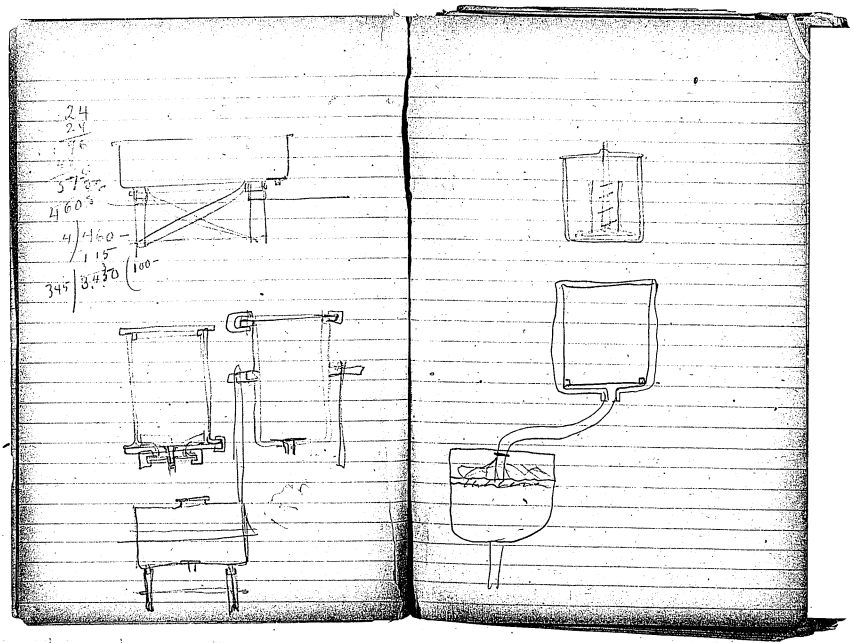
Notebook, N-05-04-22

This notebook contains dated entries from April 1905 and November 1906. All entries are by Edison. Among the entries are notes and drawings regarding storage battery experiments. There are also drawings of phonographs, including several with a "double diamond" reproducer. The pages are unnumbered, and several pages have been removed from the book. Approximately 90 pages have been used.



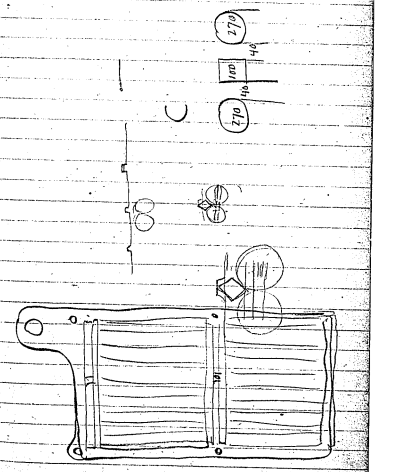


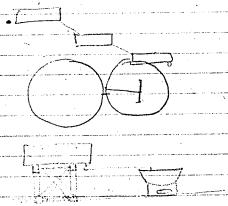


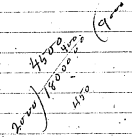


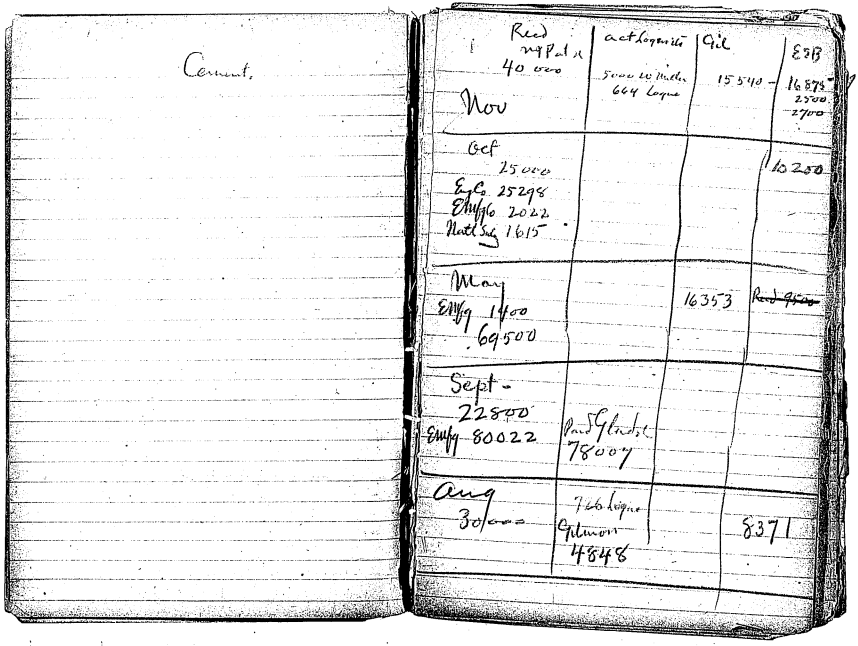
9mm- Nickel-Cobalt, Potassium -
Hydrogen Oxygen Sulphur -
Manganese Mercury
Carbon Oxalic acid, Nitric acid
Sulphuric acid, Hypochlorous
acid - Sugar, Rubber, Water
Cadmium, Copper Vaseline,
glass,

April 22 1905 SB






45°
180°
45°
20mm
9cm

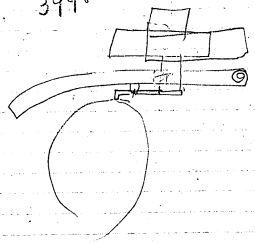


Comment.

Red MPal N	acetoxynaph	Gil	ESB
40 000	5000 in Made	15540	16878
Nov	664 Logue		2500
			2700
Oct			
25 000			10250
EngCo 25298			
Emfg 6 2022			
Natl Sug 1615			
May			
Emfg 1400		16353	Red 9500
69500			
Sept -			
22800			
Emfg 80022	Paul Glucose		
	78007		
aug			
30000	746 Logue		
	Optimum		8371
	4848		

April	Aug.	Qc	SB
58000		10190	
June			
76000			
July			
31500		10983	

	Reed	Qc —
May	69500	16353
June	76000	
July	31500	10983
Aug	30000	4548
Sept	102800 —	15540
Oct	50000	47724
Nov-	40000	
	399800	



1 000 000 — 1" H_2O 16 gram 62500 cm to milgm

Brace

625000 cm to milgm —
water weight —

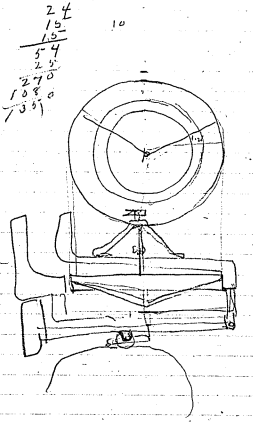
Dia 1.75 dia .002 thick 3/16 flange — 1.
Top 3.062.500 cm 1/1000 deep .002 — 6.125.000 cm
flange 1.953.000 — Total 8.078.000.
Total wt 129 Milgrams
B braces 2.625.000 only 42 milg
Tube 540000 cm 1" Long/16 cells .003 thick —
8. milgms
Al Spec g 2.5

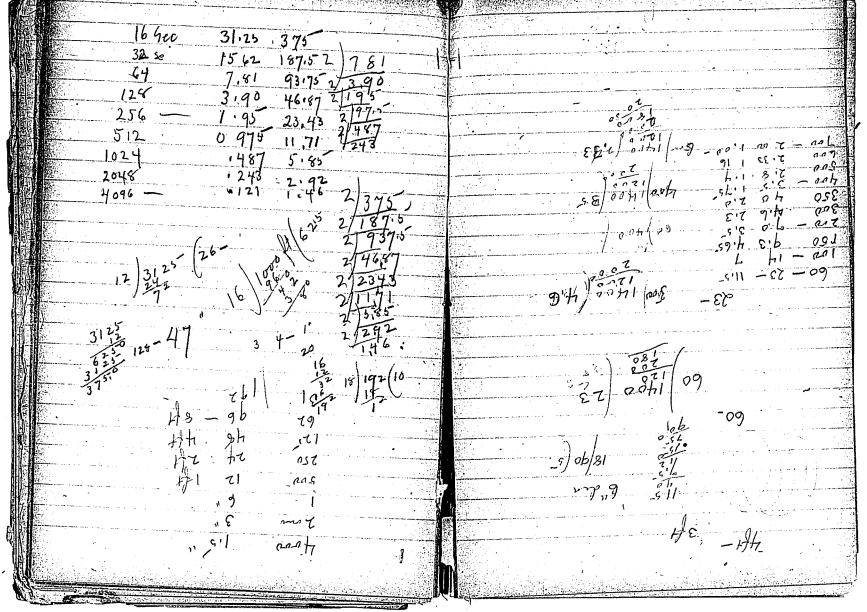
Total wt Aluminum	129
	42
447 Milgrams —	171
1 351	2 5
582 Total —	855
Lewis Rubber Connector	351
Top 2 cc 135 milg	447

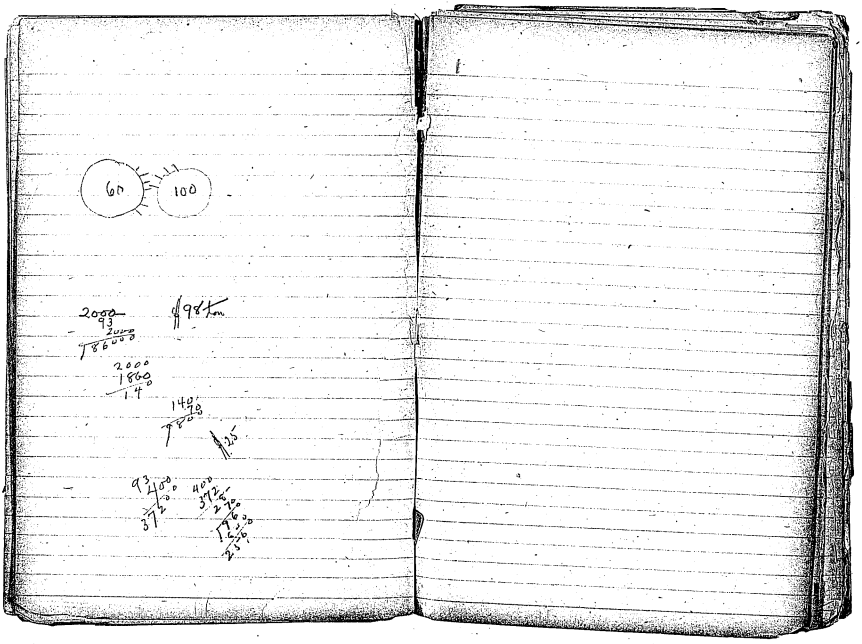
312 milg

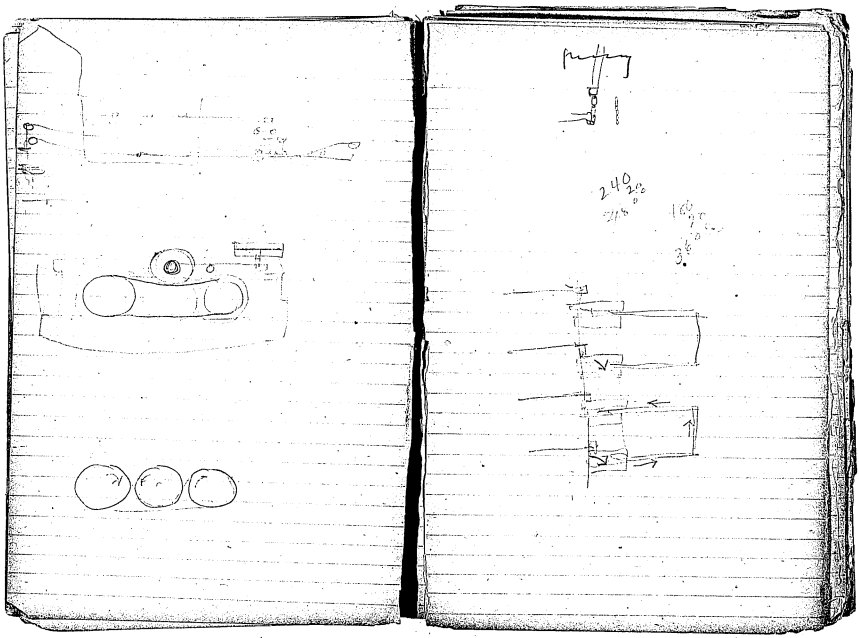
1/4 x 1/4

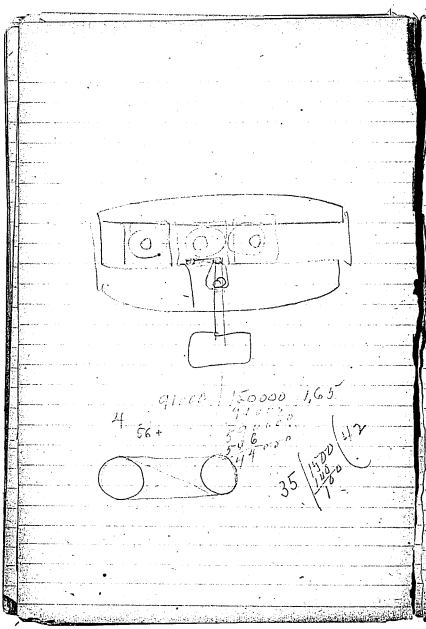
Lever 1/2 x 200 high 15/mm thick
1.500.000 Ohm — 24 milgram —
Ends 15 milg Commutor 15 milg Rubber 10 milg

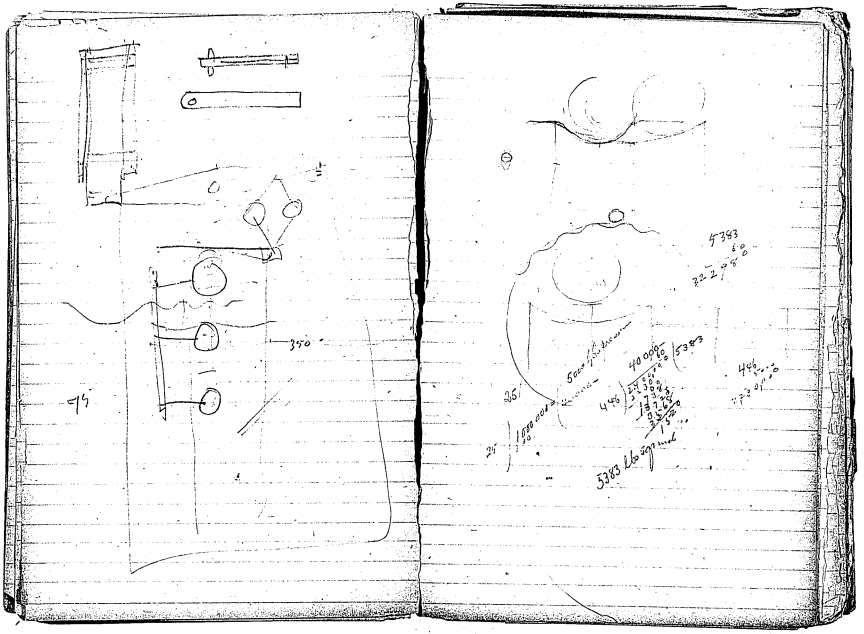


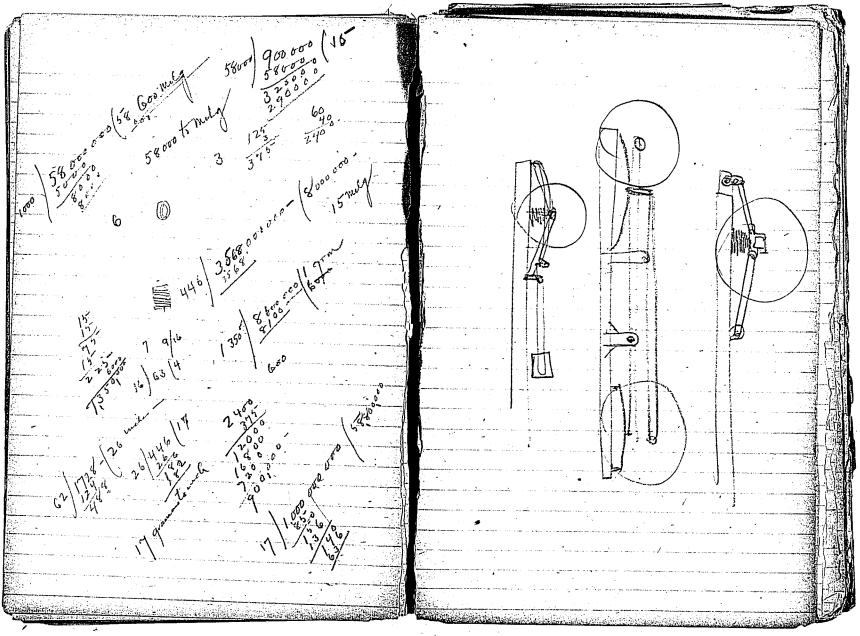


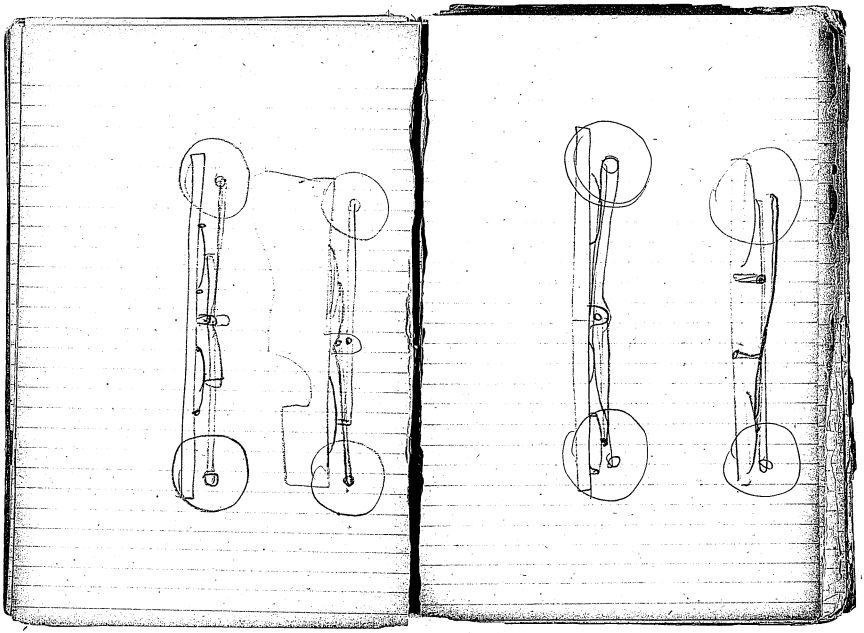

60
100
2000
93
186000
1860
1.4
$98 hr
14 40
18
180
35
93
400
37 5
40°
37 5
2 70
16 00
15 30
2 30

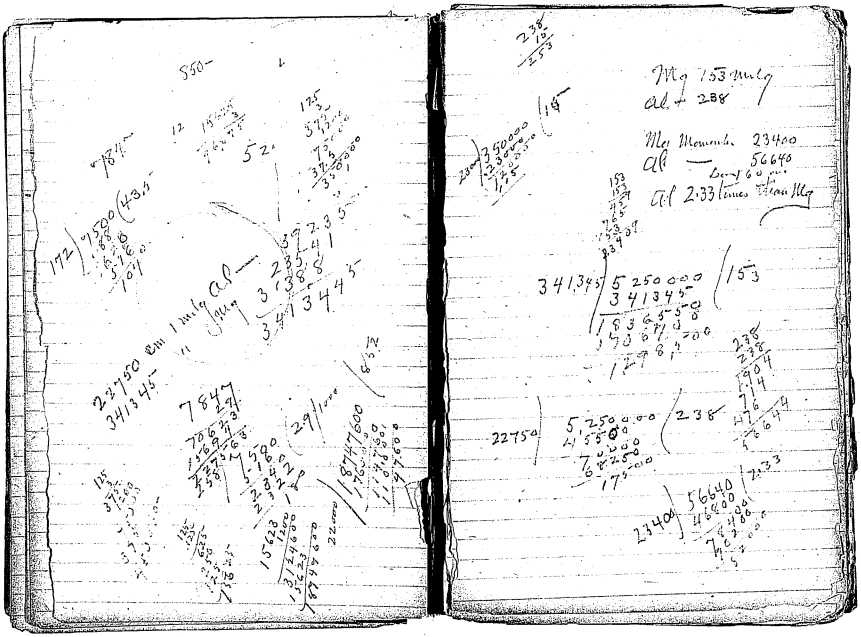


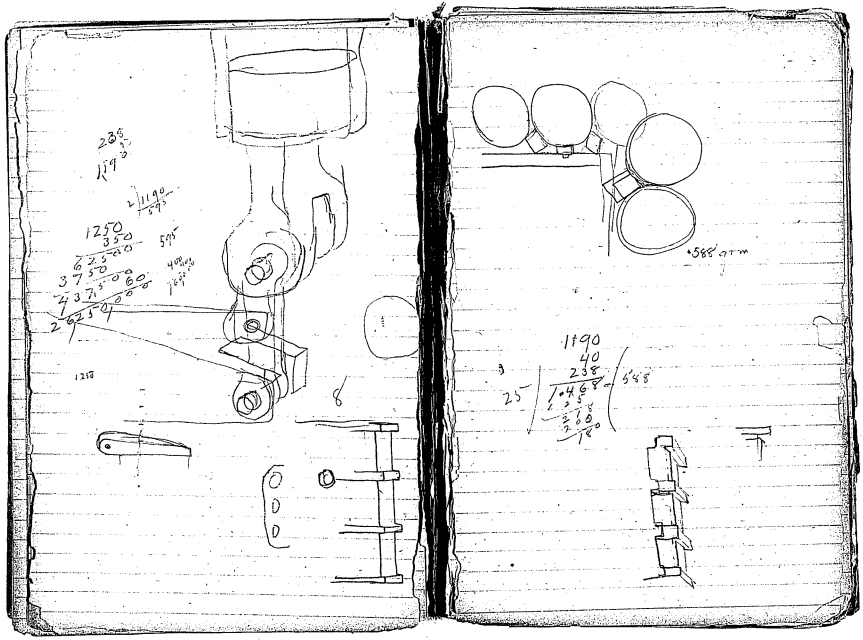

91 cm
150000
1,65
4
56+
35
42 Reps
60
80
60
40
1,6

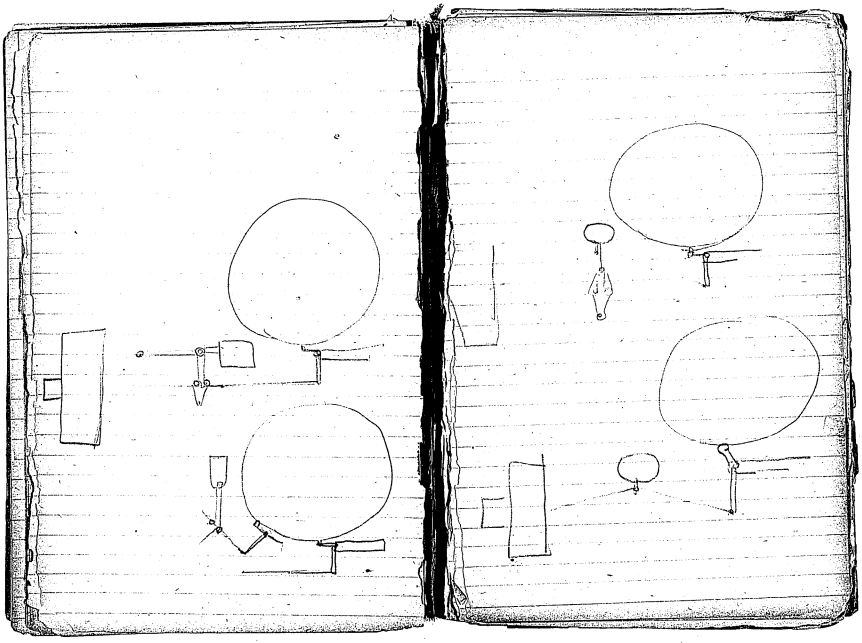

350
5383
5383 lbs
445

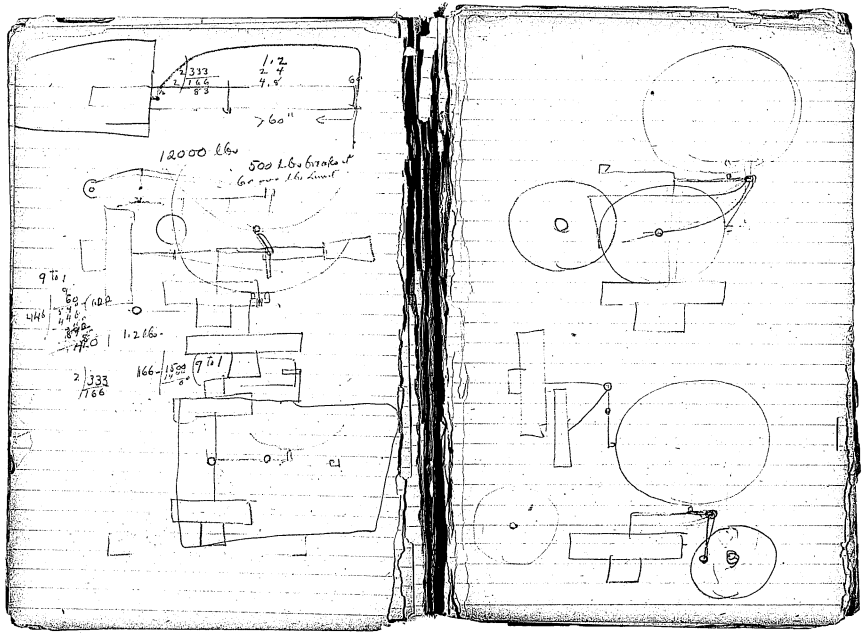


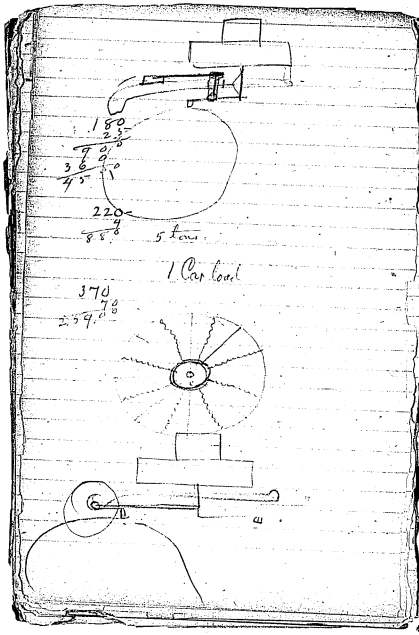


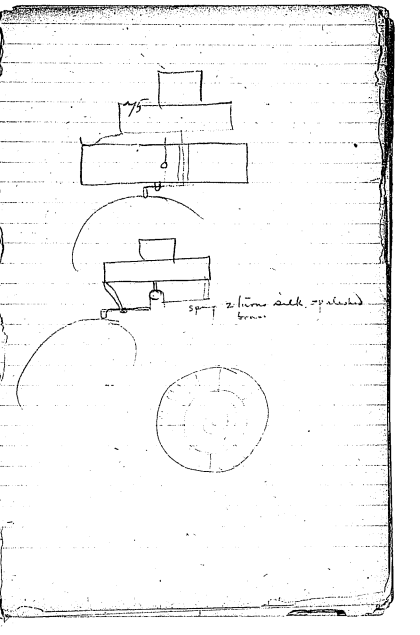


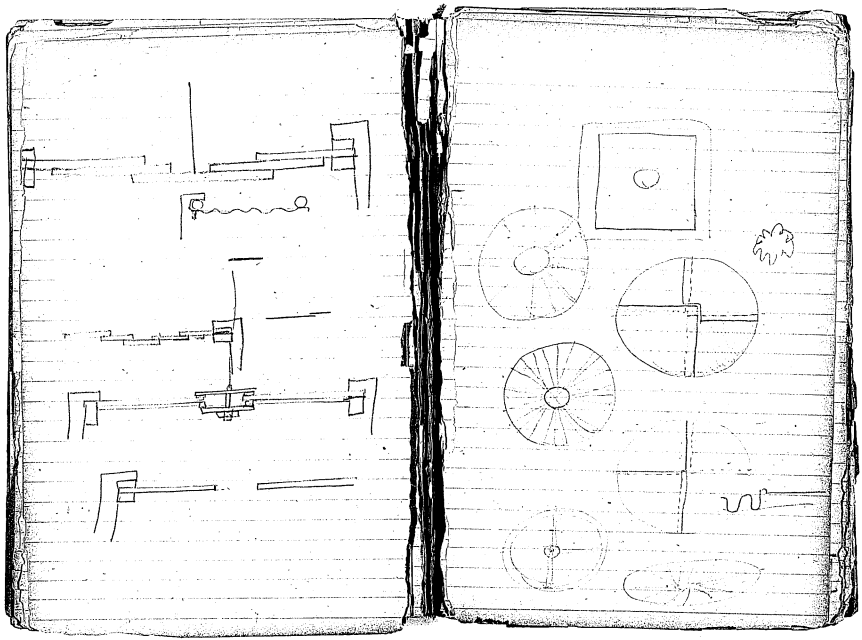

238
119
1190
595
1250
350
900
595
4 min
1 hr
1218
1190
40
238
1428
595
833
350
1190
25
5.88 atm

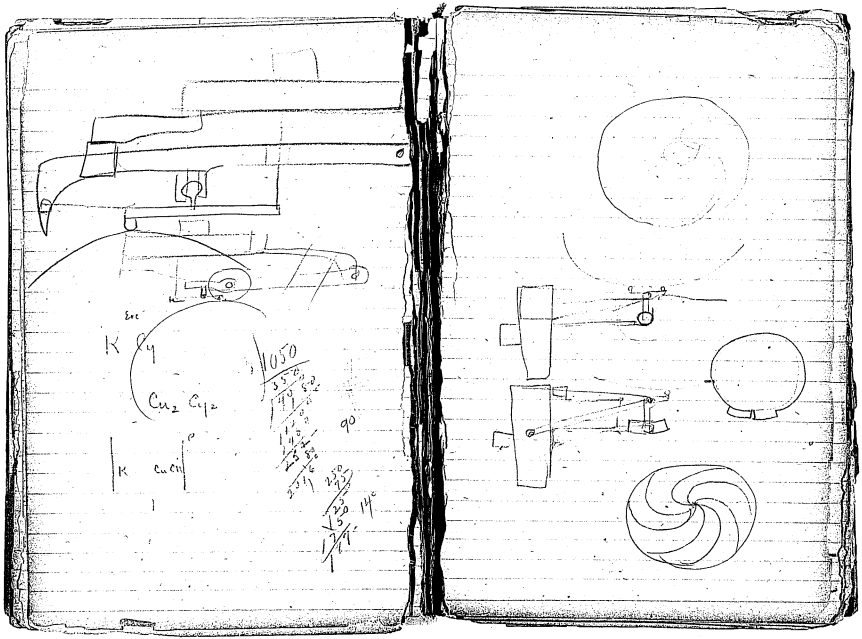


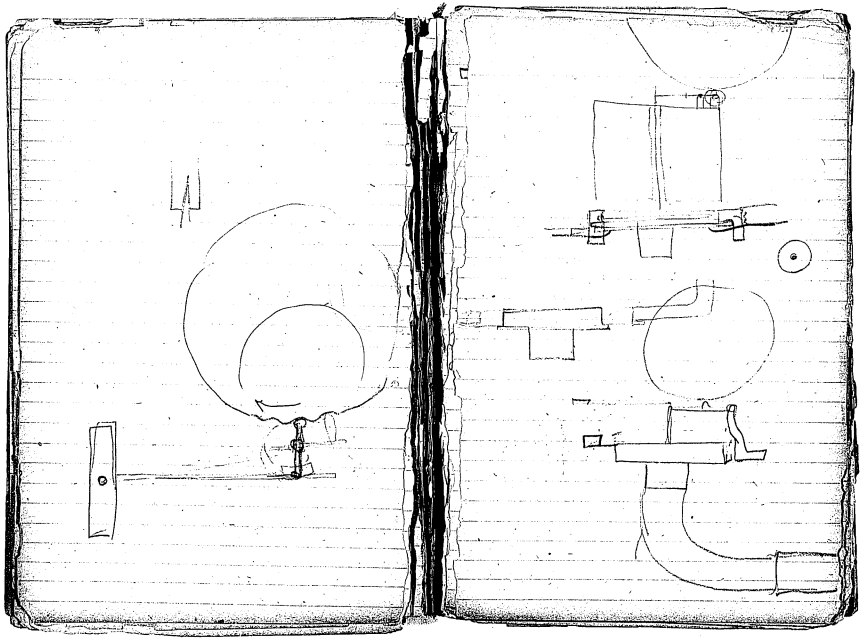

1:2
2:4
4:8
>60"
12000 lbs
500 Lbs brake at
6a mm Lbs Limit
9 to 1
1:2.166
166
7 to 1

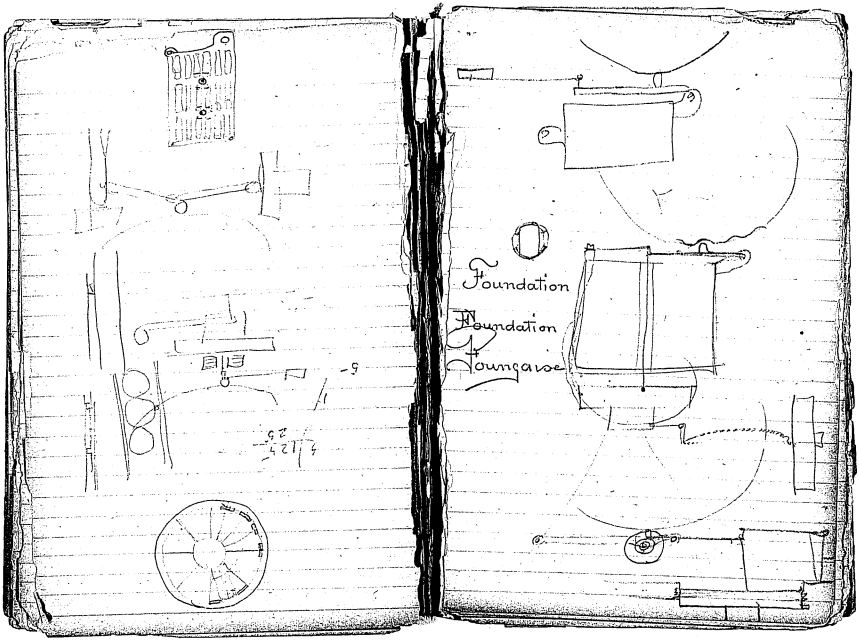

180
23
90
360
45
220
90
85
5 turns
1 Car tool
370
70
259.0
L
a

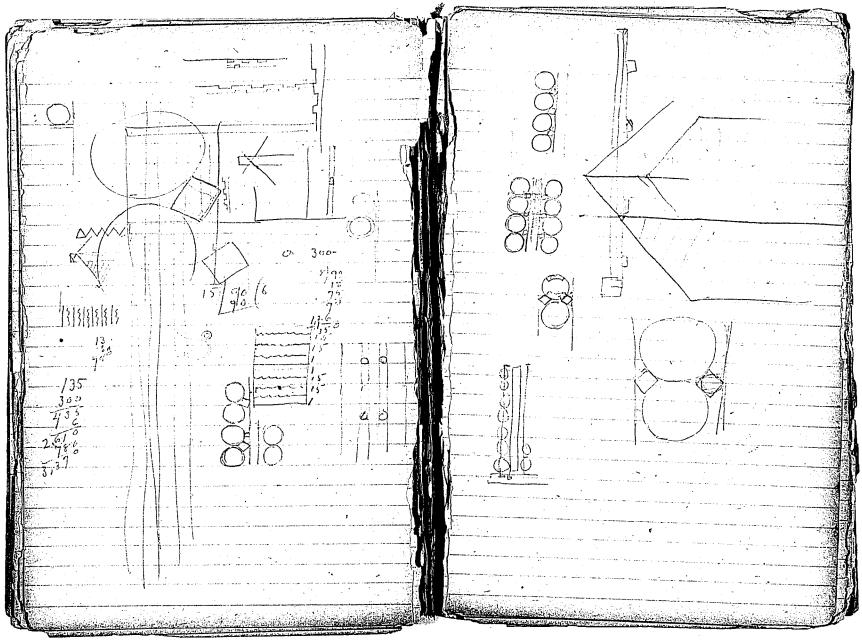

75
spr
2 turns each, spaced
turns

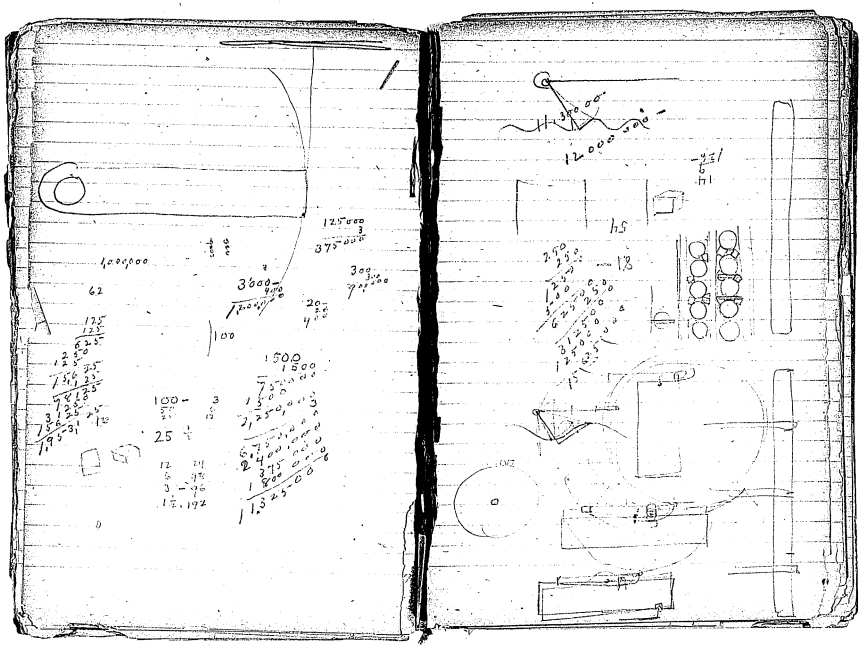


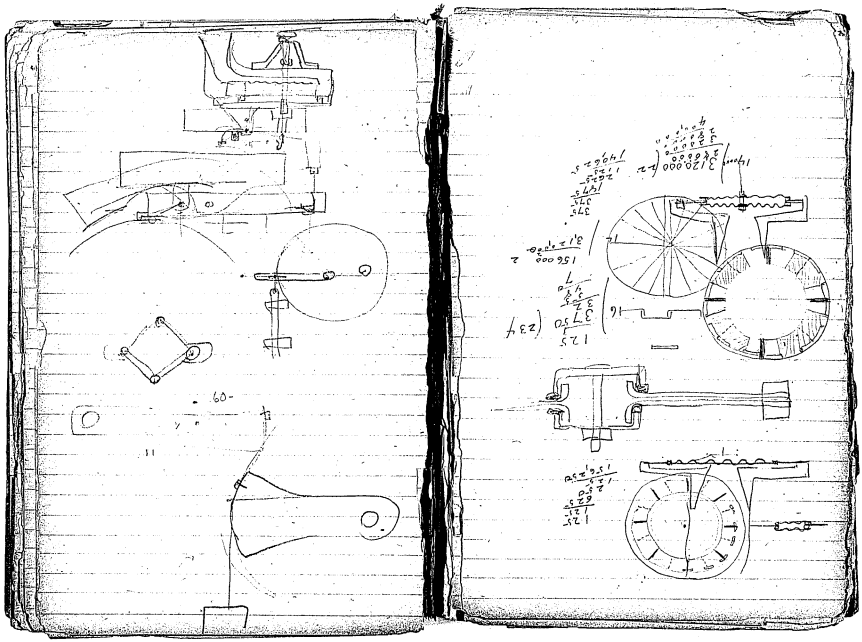

K Cy
Cu2 Cy2
90
14°

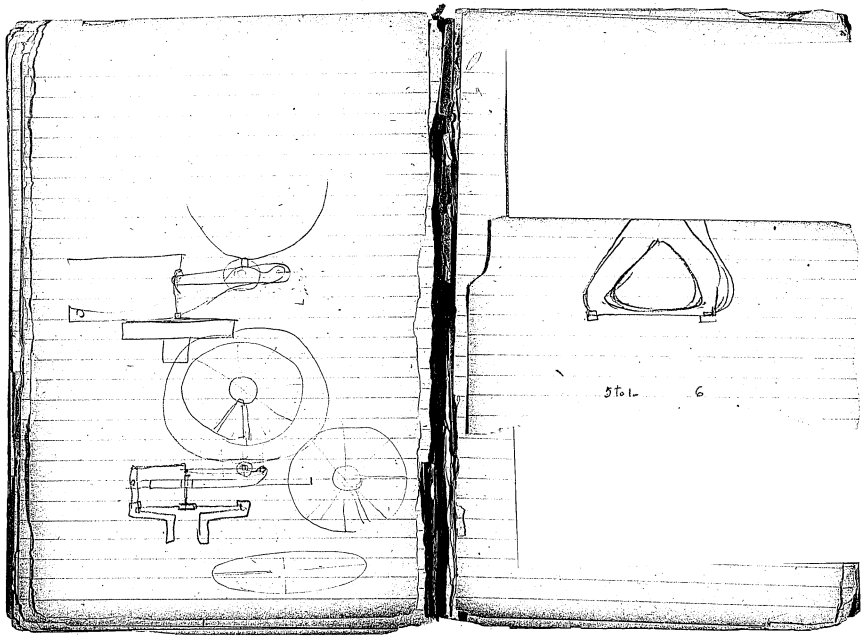


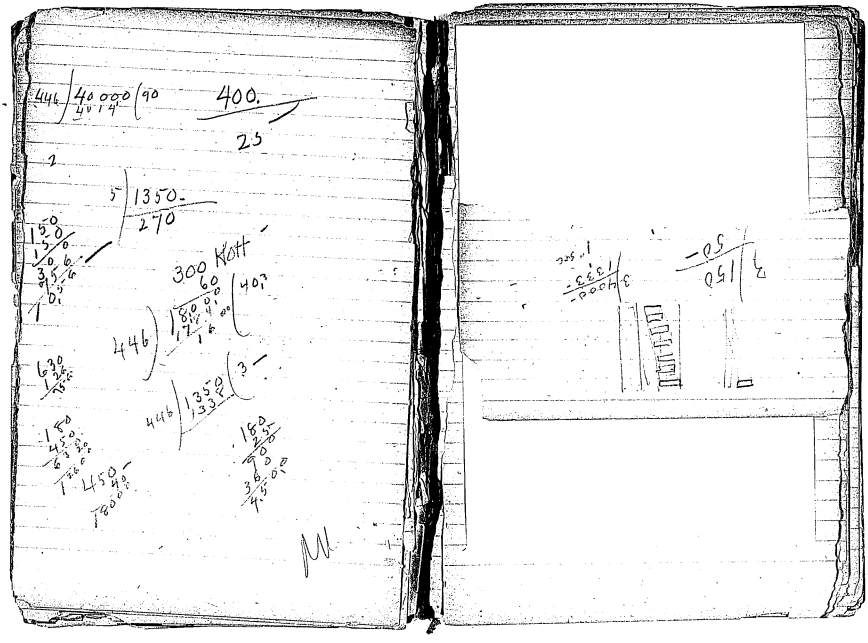

Foundation
Foundation
Fourgaise

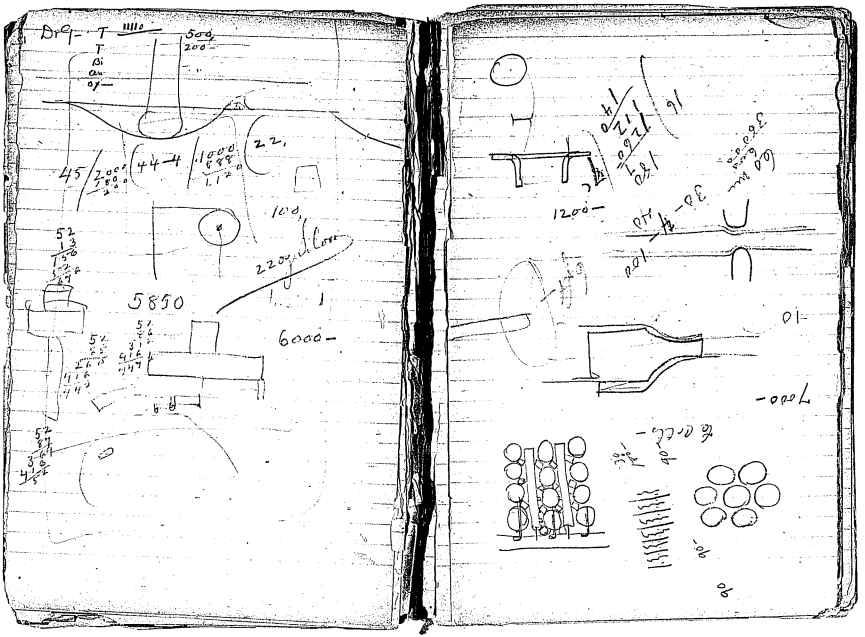


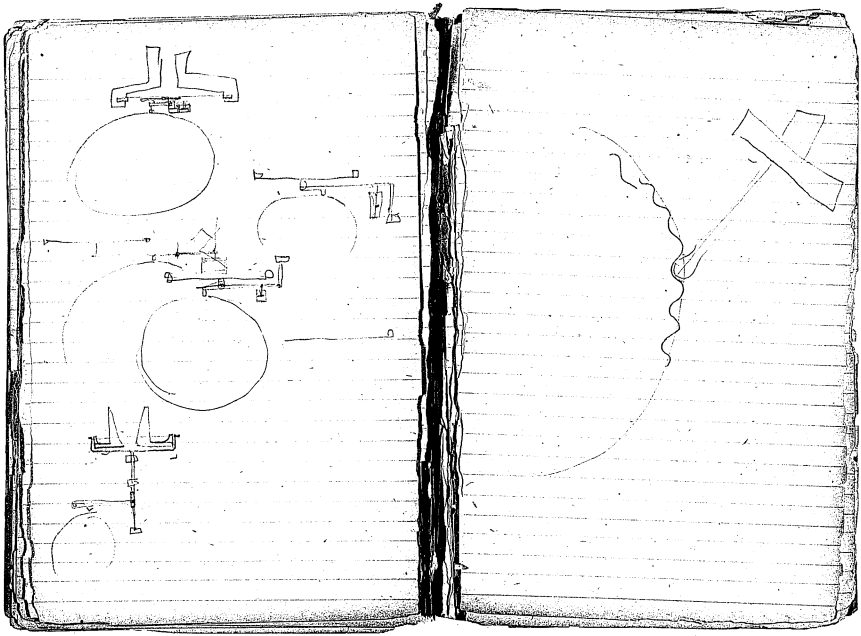


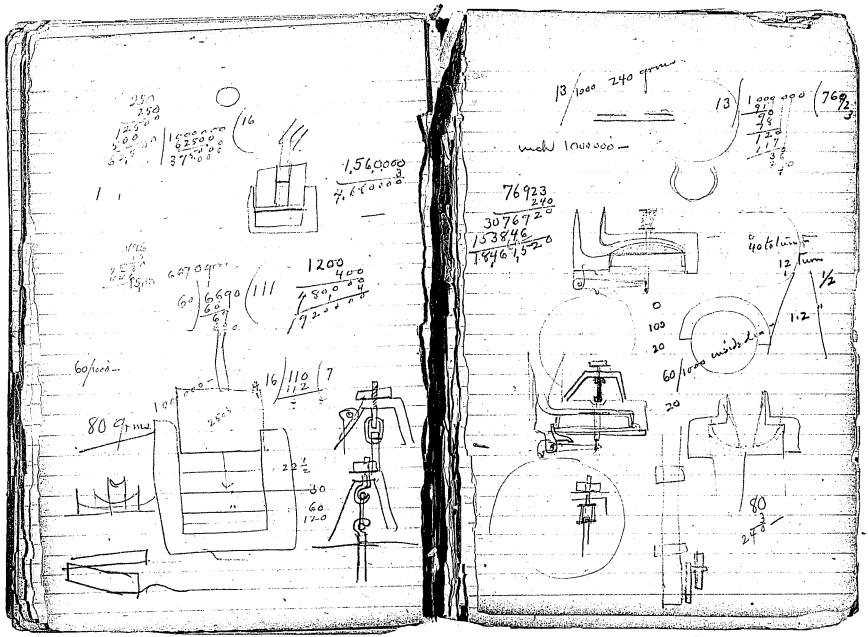


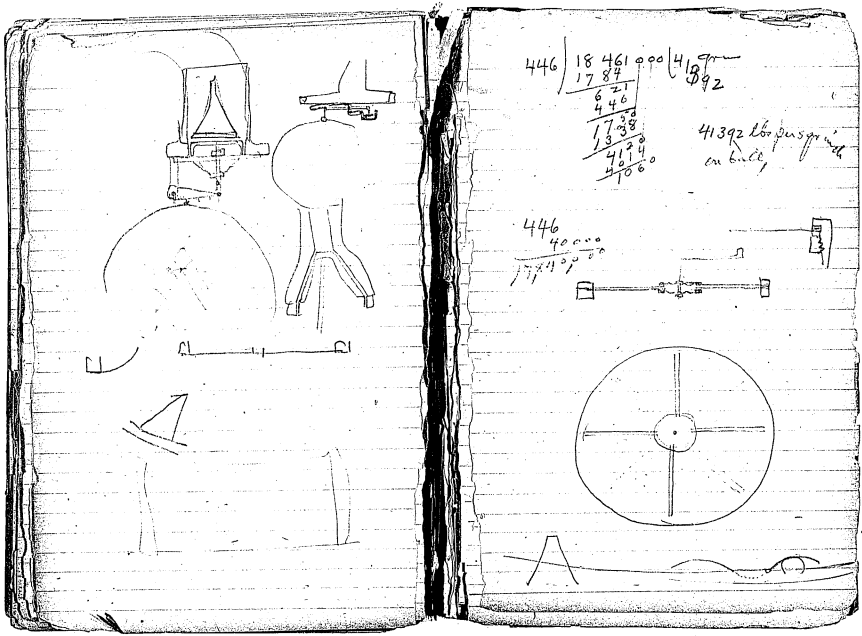

5 to 1
6

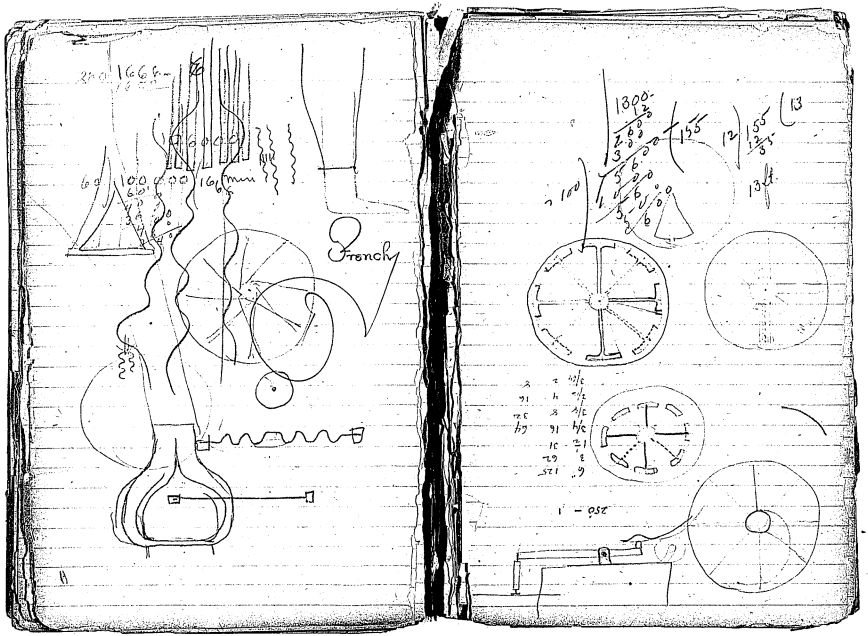

300 Kott






1,560000
1200
80 sq mm
60/1000
13/1000 240 gpm
769 23
240
307672 0
153846
1846 10 20
406 l/min
12 Turn
1/2
1.12
60/1000 mins
80
60
120


446 | 18 461 000 | 41892
41392 lbs. pressure on Ends
446


Tronchy

1st 2nd 3rd
940 933 961

9/8402
933

9/8464
940

9/8646
961

1st 2 3
939 906 915

9/8450
939

9/8232
915

9/8153
906

33 1763

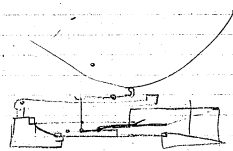
33

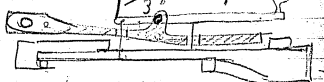
35
17
52
3
5
56
56
71

23
17
40 716 (42.9
120
180
60
52
26
312
1047
35

40 1350 (3
120
150
1

R 33 — No. 4219



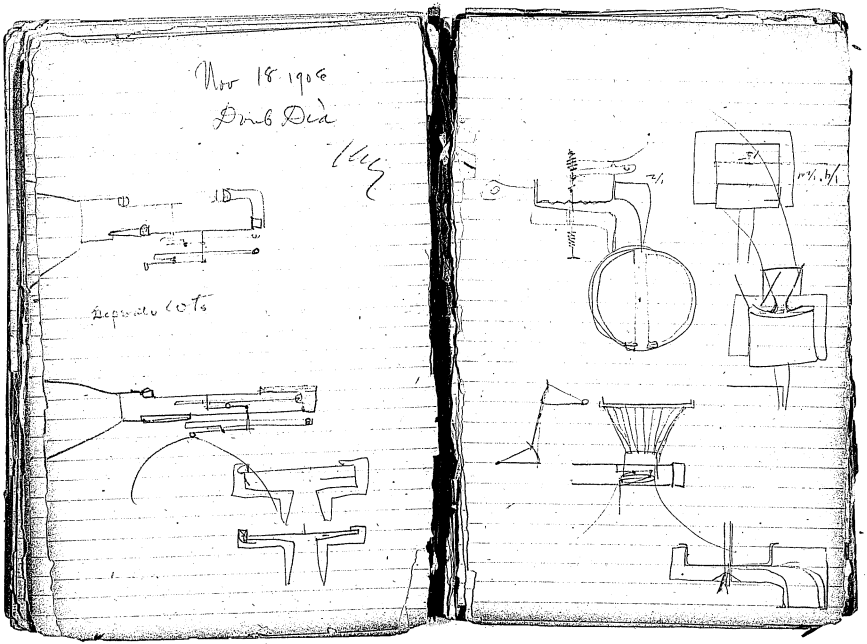


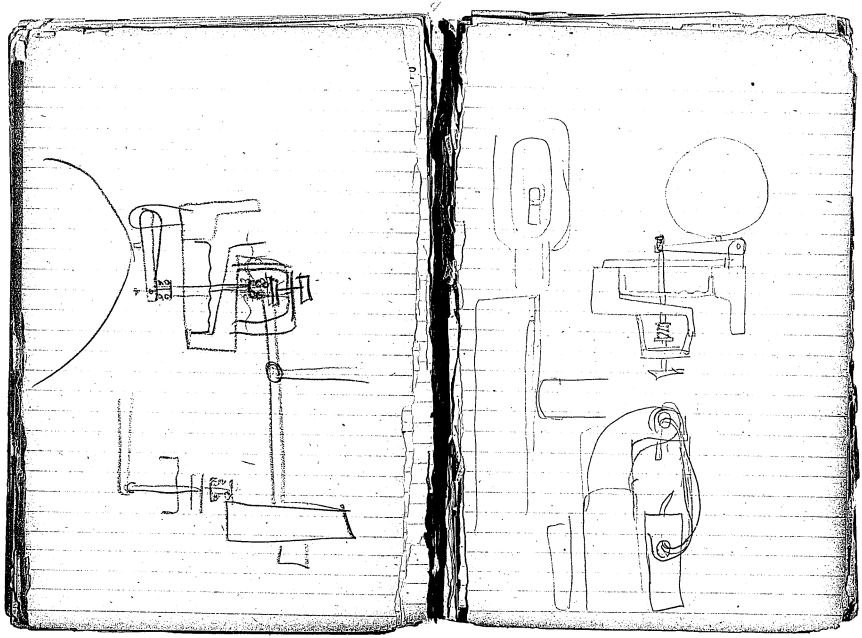
27
5.1
42
105
105
2 (27
50
42

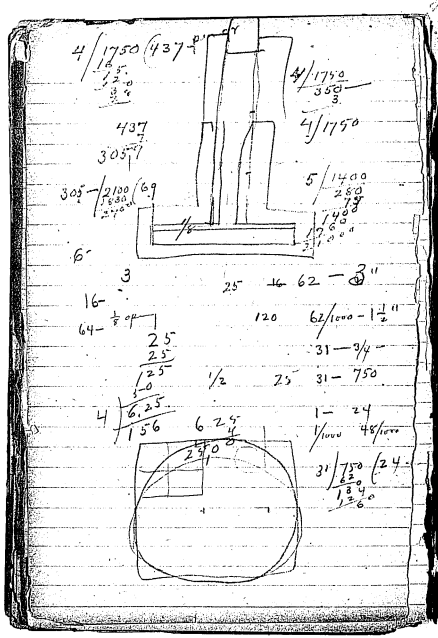
15
52
3
75
80
40
3

16
52
3
2
80
832 (2

Nov - Dec 1766
No 1 Double Bed
Scale: one inch to a foot
Oak Stain Finish


Nov 18 1906
Dumb Dick
Separate cots

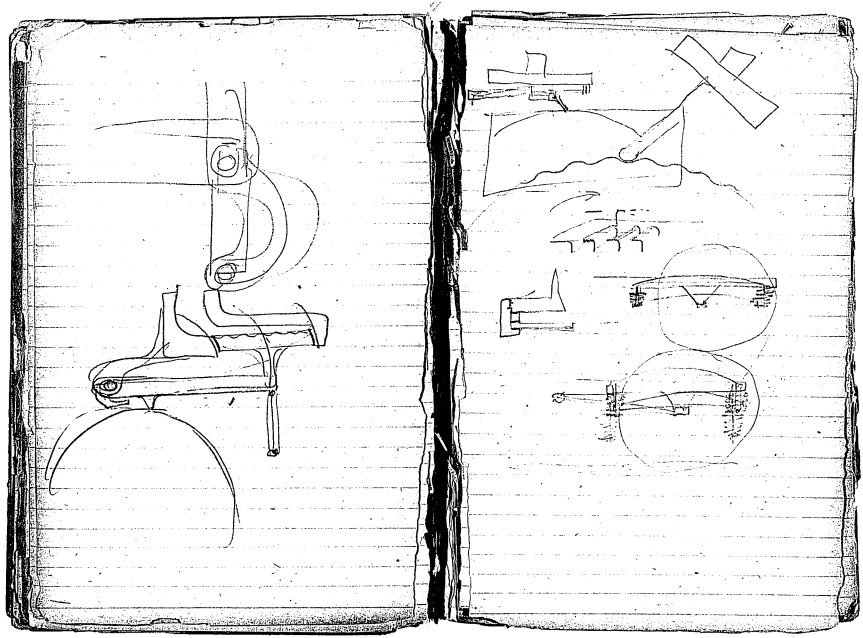


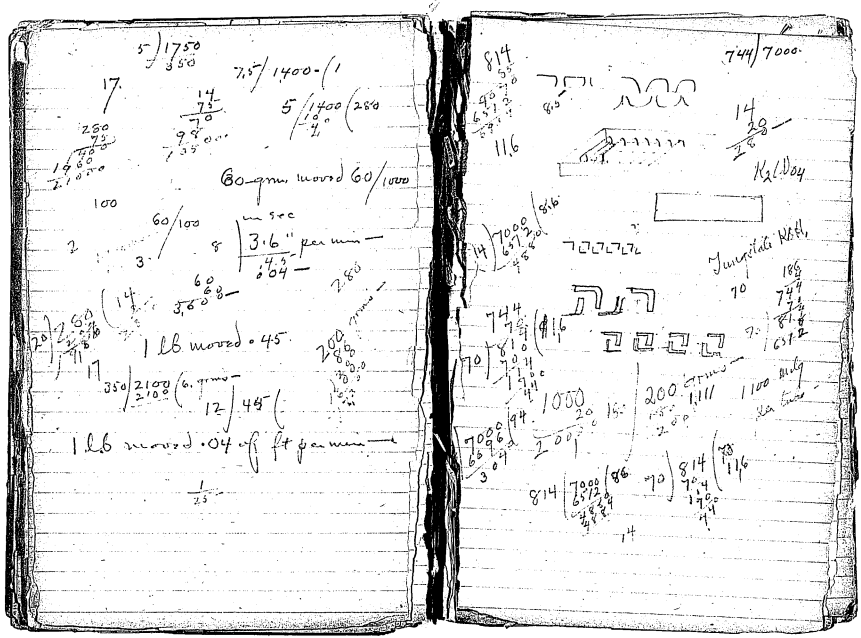


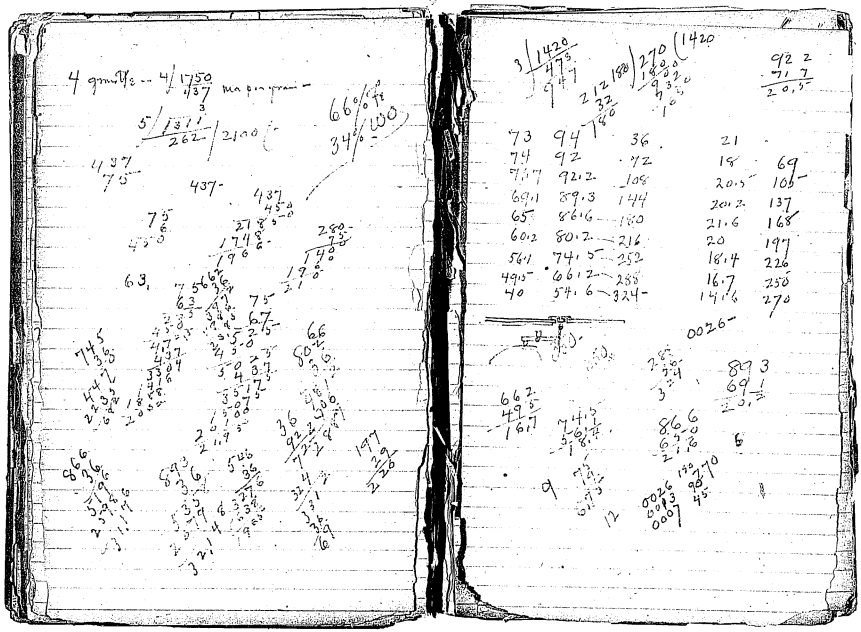
When freshly pp. Silence Ox is acted on by Hydrogen peroxide it is reverted to higher state + not real in alkali -

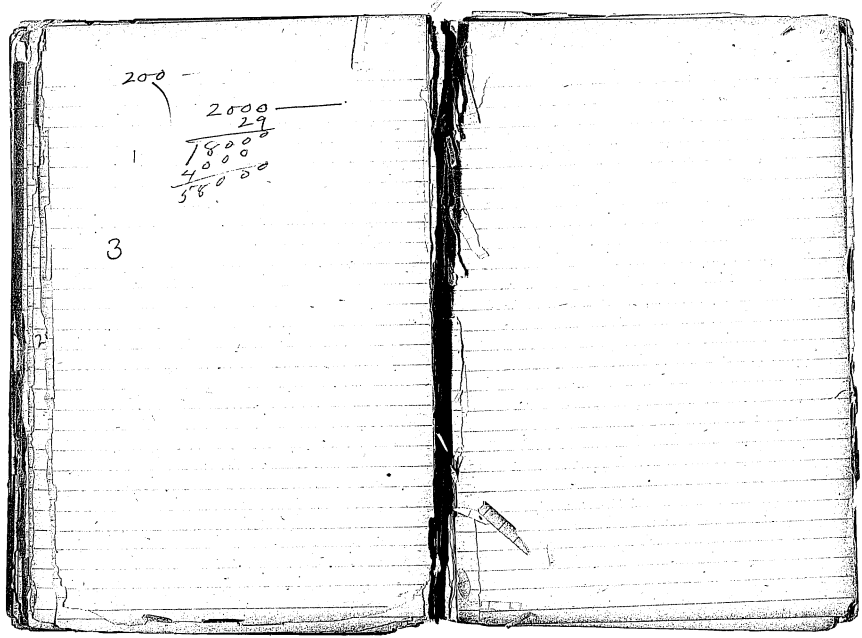
Courtland Westchester Co NY
Lots of Oroville Ore Rx

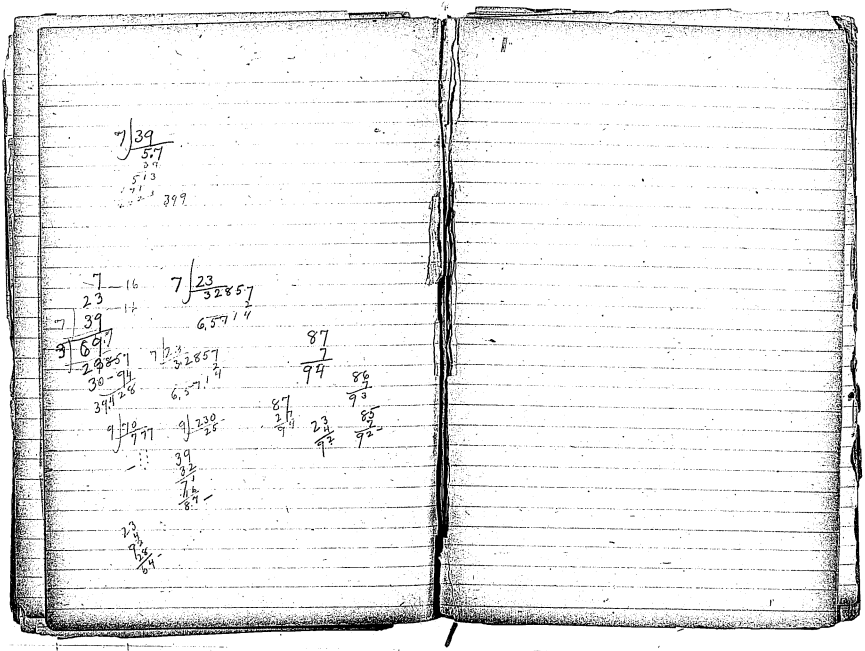
Try Reducing Mix from Sulphate
by Magnesium by adding Calcium Chloride

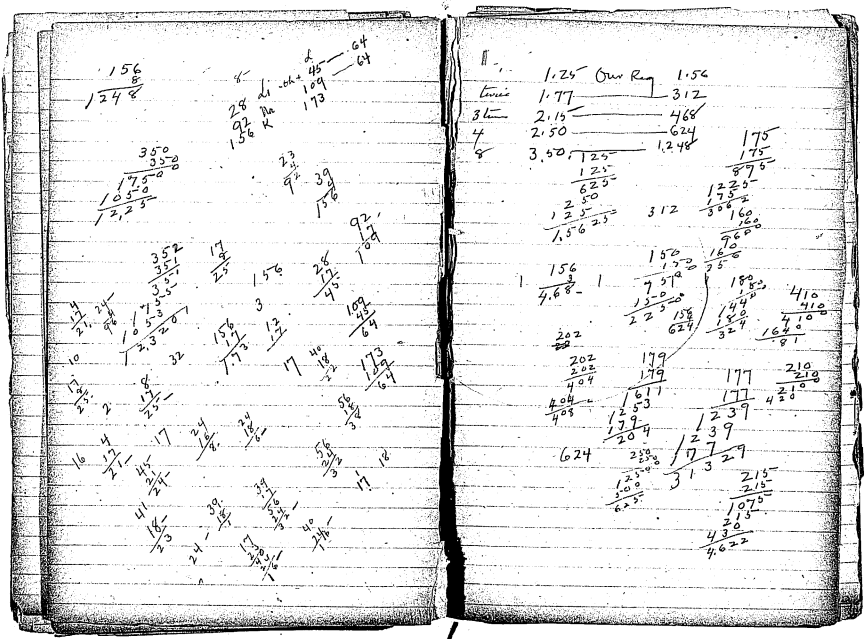


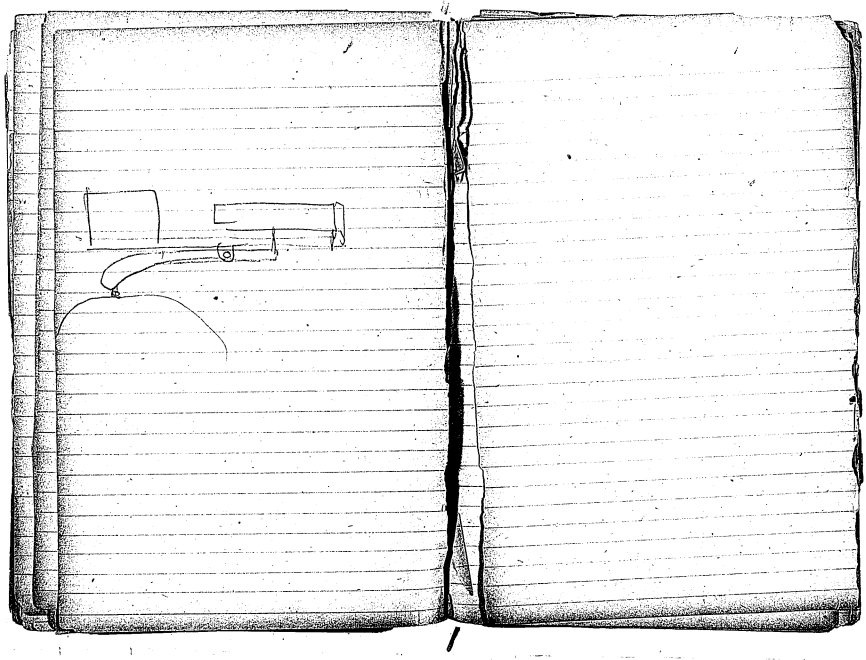


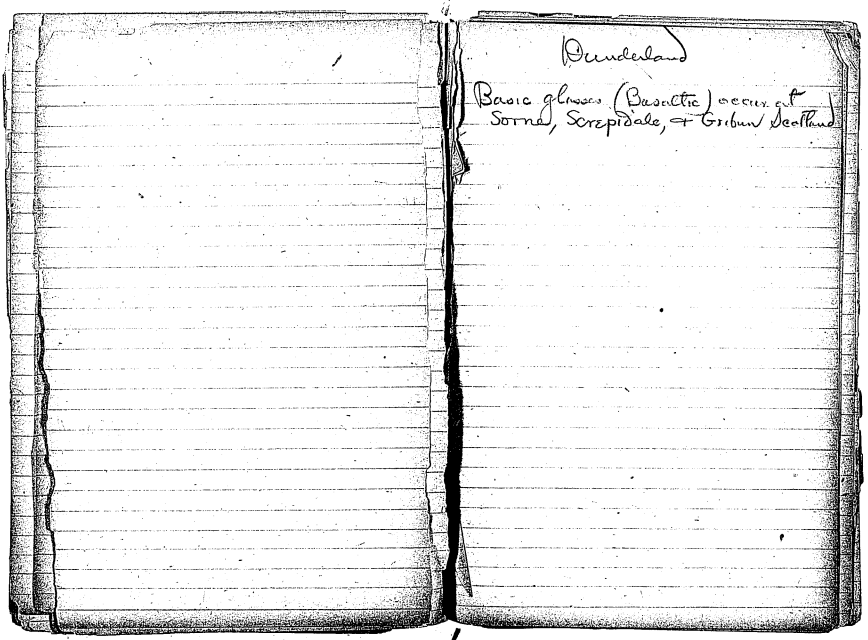


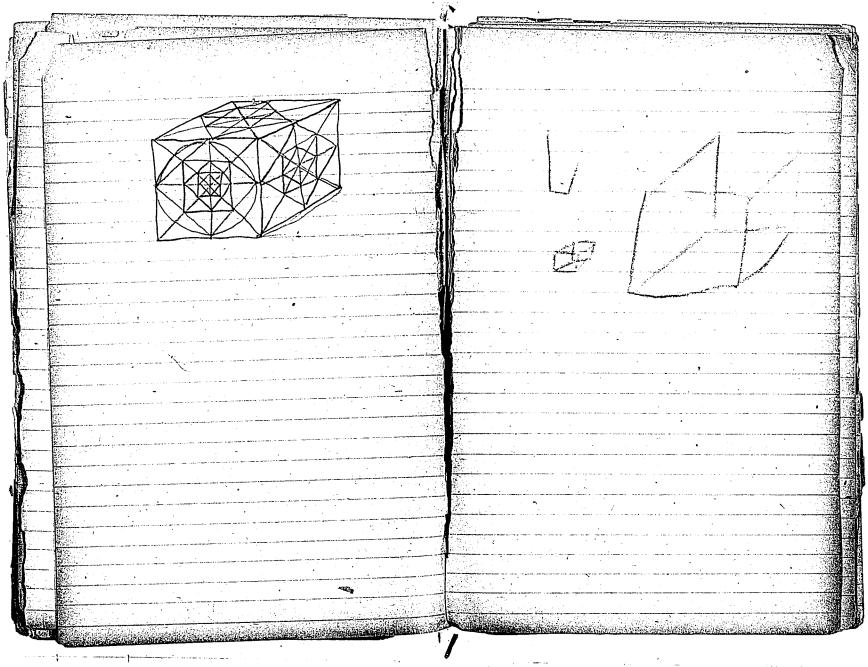

200
2000
29
1
58000
40000
18000
3

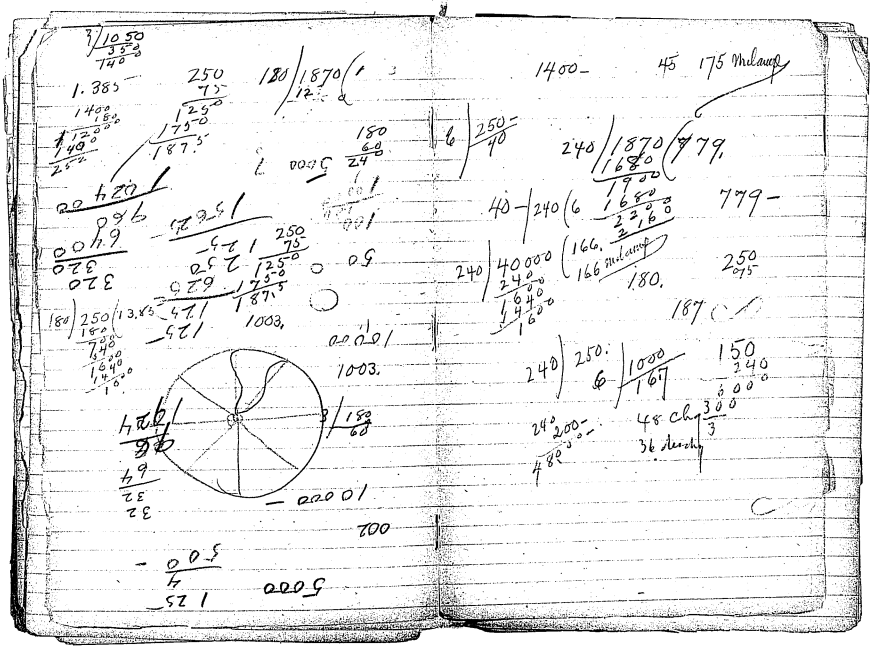


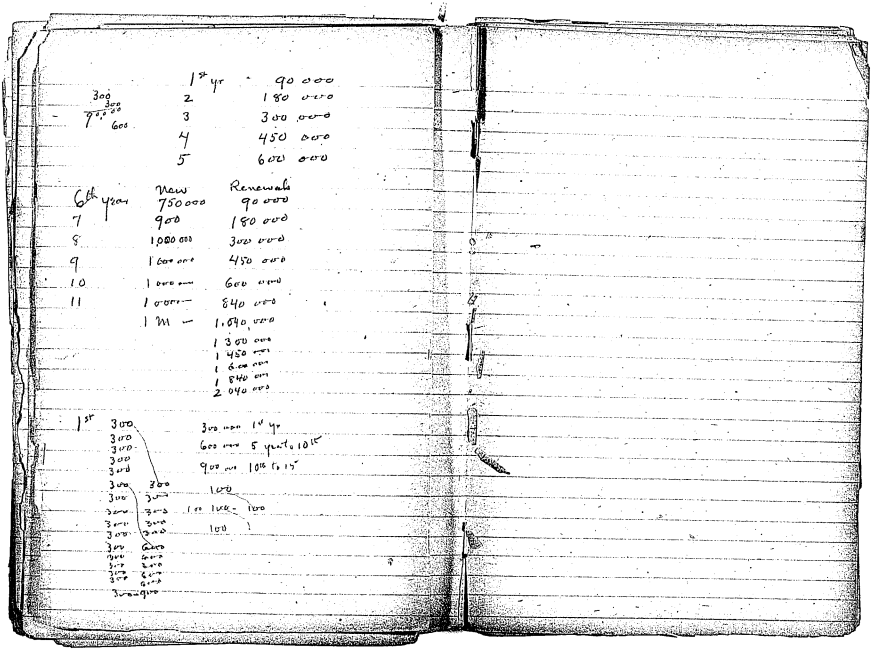


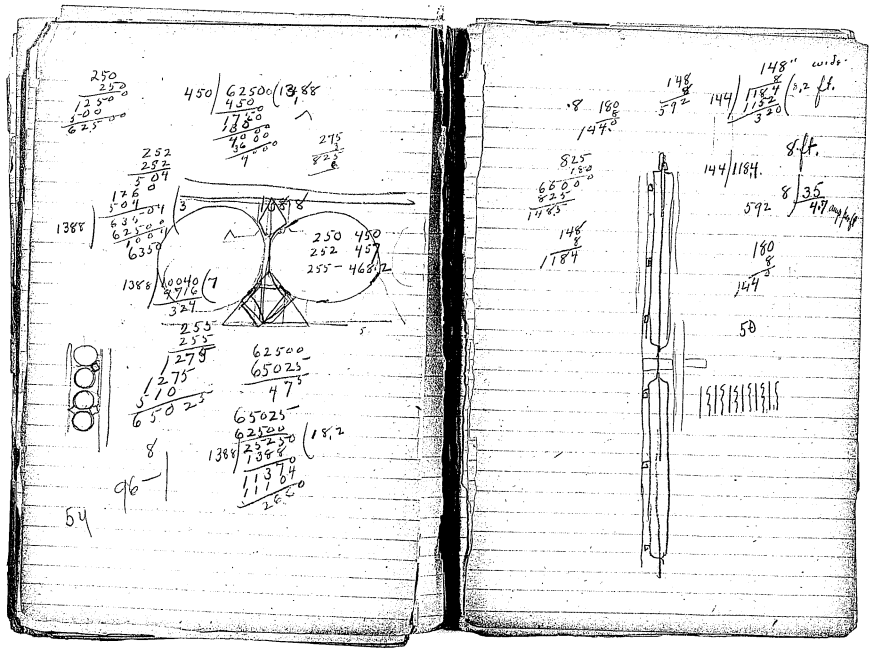


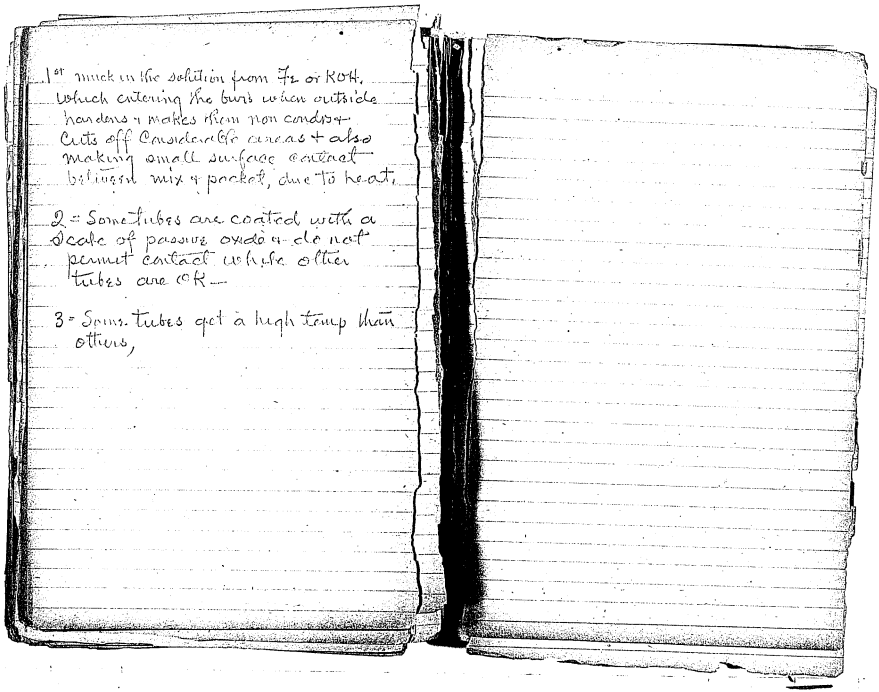

Orkneyland
Basic glasses (Basaltic) occur at
Sorna, Scrapidale, + Grisburn Heathland







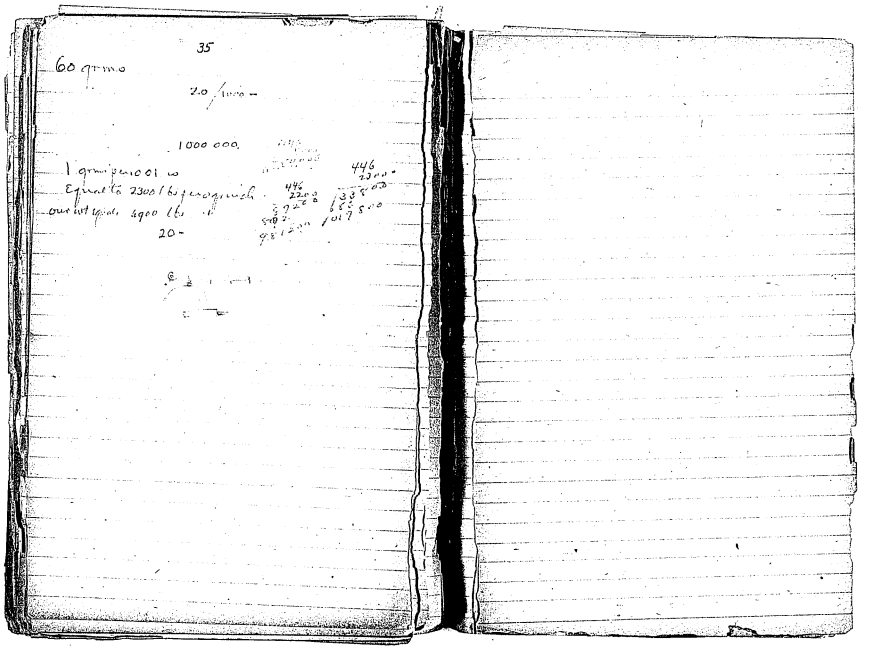




1st mixture solution from H_2 or KOH. which entering the burs when outside hardens + makes them non conduct + Cuts off Considerable areas + also making small surface contact between mix + packet, due to heat.

2 = Some tubes are coated with a scale of passive oxide + do not permit contact while other tubes are OK —

3 = Some tubes get a high temp than others,

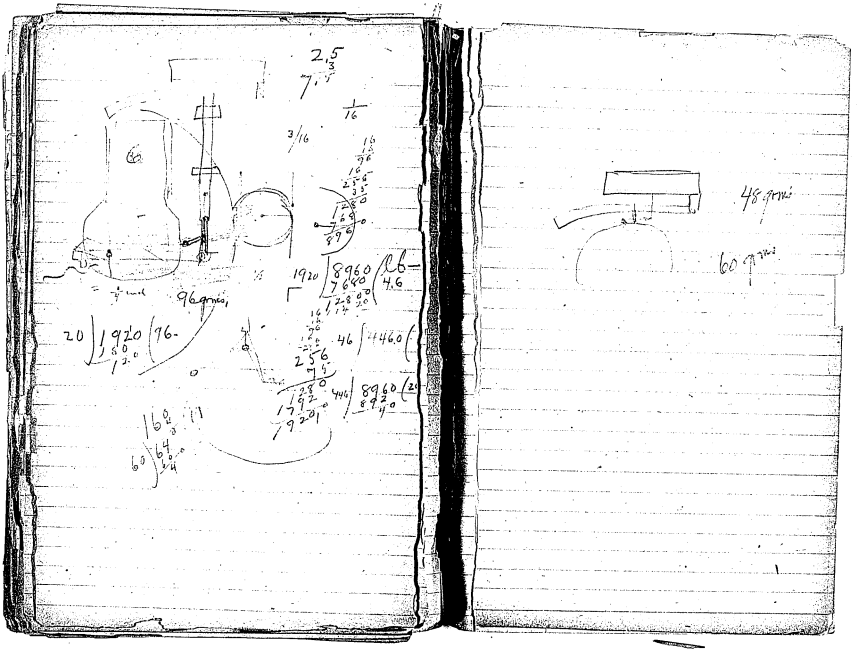

35

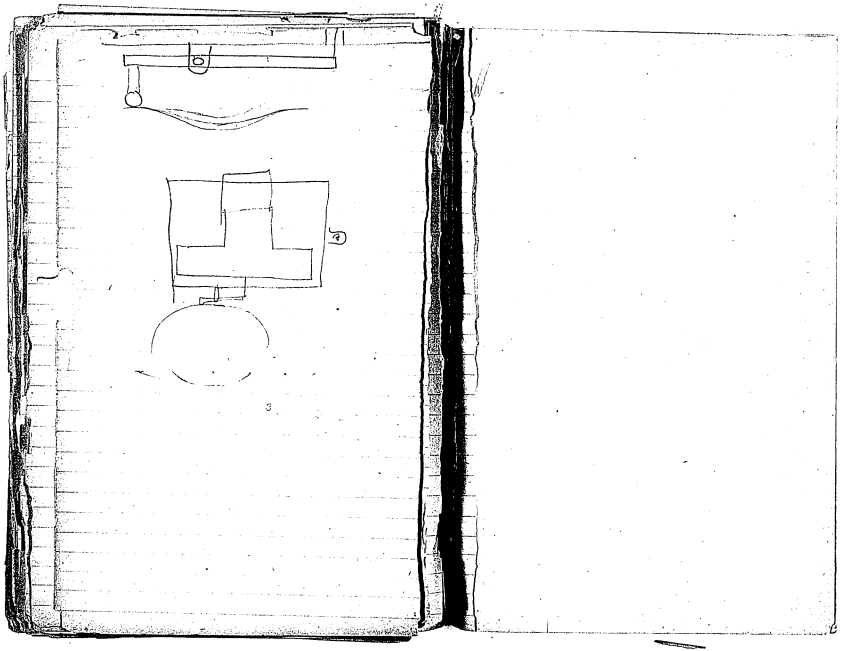
60 qr m o

20 f 1000 –

1000 000

1 qrm pieni 01 w
Equivale a 2300 libre grosse
our wt qrs. 4900 lbs
20 –


2.5
7.5
1/16
3/16
96 grams
1920
8960
7680
1280
46
4.6
446.0
20
76.8
60
64
48 grams
60 grams



Notebook, N-03-06-19

The first entry in this notebook is dated June 19, 1903, but the correct year is probably 1905 since related entries are dated June and July 1905. There is also a marginal notation dated January 1906. Most entries are by Edison. The book contains notes and drawings regarding storage battery experiments, along with a one-page entry pertaining to ore milling. The beginning of the book contains cell tests, numbered from 646 through 766, using acidic, rather than alkaline, electrolytic solutions. At the end of the book is a series of tube tests, numbered from 1 through 89, dealing with the packing and arrangement of nickel flake in the cylindrical tubes of the storage battery. These tests are continued in a set of thirty-six numbered notebooks designated as "Mix Books" or "Tube Books" (see Notebooks by Edison and Other Experimenters, Group 4: Tube Books, Nos. 1-36). The front cover is labeled "Storage Battery Important Data." The pages are unnumbered. Approximately 180 pages have been used.

June 19 1903 SB

Made some glacial Phos acid - then neutralized it with KOH, 38% till yellow. Then put ~~9 cc 6 Volts 6 Coulombs~~ 10 grams glacial in each cell + poured it full of the KPhos solution after dissolving the acid. found that the solution was still alkaline! - They had been on warm plate for 1/2 hour before I tested them with Litmus. Can it be that warmth changes it to ortho - I now put in 5 grams more glacial in each cell making 15 grams put in - What is wanted is that the solution should be decidedly acid -

Then in each Gallo I will put 0.9 bad Cell, nickels,

646: Acid Solution Metaphos K -
2 Ni to work Dry
2 " Ta go in grids wet
to be washed 4 hours water + go into KOH 21% hot then water
Soak all night - test sol

6¼ AW 92
6¼ BW 102

8 20 am -
646 - after pulling in water
Dark Colloid floated out in large quantity in 10 minutes after putting in water.
after 4 h water so much colloid put in KOH, at 12 noon

647AB 387-390-381-380 650 AW 0-110 649AW 1143 1177
646 " 267 293-297 647 " 123-165 648 " 983 1050
649BW 1103-1140
647BB 310-317-309-305 650 BW 150 648 " 1010-1100
646 " 327-350-325 647 " 177 649CW 1127-1133
646 " 100 648CW 1200 1260

The solution cleaned all pockets 646-7-650-651

The solution used in 646-647-8-9 +650 651 is very strong and fairly new but not enough to entirely discolor turn the blue Lithmus perfectly red- but nearly so - it was about one acid in the morning - There is a very large amount of naked discolored out + I from they are damaged - probably 6 hours or Even less will ruin it - & changed waters - but it does not come out as rapid on this change after 3rd change no coloring comes out but only green solution Eventually Cochineal runs only in Edges of Grains -

Had 649 in heater 2½ hours it gained bad look to it -

647 - 2 ni to be tested Dry
2 " " " WET,
The Nickels to go right in 21% KOH. the moment they are taken out of the Phos Solution - To soak all night in Phos Sol test sol -

648 3 old Irons to be worked in regard to KOH 21% as 646 in KOH at 7 pm -

649 3 old Irons to be worked as regards KOH 21% as 647

650 - 4 nickels to soak all night then taken out + dried on heater + then put in 21% KOH hot 2 to 6 hrs in dry + WET

654 AB	153 - 177	180		654 AW	92 - 98	
653 "	183 230	217		653 "	0	110
652 "	355 388	367	305	652 "	0	87
650 "	288 327	307				
654 BD	0	193	0	654 BW	87	-123
653 "	260 293	276	0	653 "	157	173
652 "	317 324	320	304	652 "	0	168
650 "	375 403	389	304	650 "		118
		403		647 "		227
		397		646 "		139

647 & 646 [illegible] taken [illegible] solution

100 cc of the Original mixed Solution had one gram of dry precip by KOH, not washed perfect. Others made 4 packets, these varied gave 250 milg Sr extracted from 1 each packet - 1 thimble fume of the pp as mend etc - ably. 50 mil gram -

Further work 100 cc sol had 1500 of Ferric + other stuff - Co hook for 4 cups gives. 450 milg per cup -

650D - 405
647A 383
652A 405 - 404

Hold this -

651 - 4 nickels all night - dried on heater, then KOH, 21% 2 dry 2 wet

652 Having put all the Solutions 646 - 647 - 650 + 651 together - I now put 4 nickels in for a 6 hour soak hot - 2 dry 2 wet Put in H_2O of fumes KOH, - in KOH at 7 pm -

653 - Dup of 652 but only 3 hours soak hot - 2 dry 2 wet - of fumes KOH, in KOH 7 pm -

654 - 4 ni dried out on heater, then immersed in the Solution used in 652 + soaked 20 minutes, taken out dipped in water for 1 second then dried on heater then put in KOH for hour or so + washed with water by soaking - 2 dry 2 wet

658 W 432 - 460
657 W 425 457
656 W 463 sc.
655 W 433 457

note

652 & 647 & 650 Grest ~~as 656~~ on previous pages -

652 - 6 hours Soak Reg wash
647 soak all night go right in KOH
650 " " Dried with Soln go right in KOH -
— The owner go to show 6 @ 7 hours
soak in 0 slightly acid Soln
pretty right in KOH Grest - next
that will fade the glory —

655 = are 4 Reg B12 new pkts
soaked in same solution as 652
soak 6 hours - 1 goes right
in 21% 1 Dried with solution
in + then KOH, 1 soaked in water
+ then KOH, 1 soaked in water
not to go in KOH,
655 Right in KOH 21% - 5 pm -

656 Dried with Solution in
~~not soaked Krot~~ then Soaked KOH -
after soaking K_2O 2 hours - 4 clamp in
in KOH at 7 pm -

657 Soaked in water then KOH

658 Soaked in H_2O not to go in KOH,

659 aw-sc

Make a standard solution of Emmr Amend Glacial Phos acid or neutralize by 33% KOH, use 2 lbs of acid to 1000 CC water. Half of the solution which is the half now used is made neutral with a tendency towards being very slightly alkaline-
Made 6 1/6 bottles + put the solution in each + put in 4 nickels in each cell — 2 are to be run dry + 2 wet in all the cells —

No 659 up to soak in Neutral Standard Solution 2 hours + are then removed + put in water, after proper washing in water they are to be put in 21% KOH, but for several hours + then washed in water + count up to test, 2 to run dry 2 wet.

660 Dup of 659 but soak 3 hours.

664 AD	216	226	664 BD	205	190	665 AW	32	
663 "	300	287	663 "	312	300	664 "	79	
661 "	330	352	662 "	187	169	663 "	122	
660 "	50	323	660 "	250	220	662 "	92	
659 "	50	209	659 "	102		661 "	127	
						660 "	108	

662 AD 263 -

661 Dup of 659 Gut soak 4 hours

662 Dup of 659 Gut soak 5 hours

663 Dup of 659 Gut soak 6 hours

664 Dup of 659 Gut soak 7 hours

The solutions in all the above from 659 to 664 up to 62 dawed

665A 225
66

The preserved solutions of 665 to 670 are greener than those of 659 to 664 - but they are only a very light tint showing very little Ni / 665 is faint

The other 659 groups 659 + 660 are white + 661 only just a tint

In the morning 7 hours after last one put in water + 9 formed in both groups that the water was turbid stronger than the original solutions,

The pockets in both groups are fairly clean except the short time soaks leave slice unopened -

Solutions are to acidity are alike the same after 13 hours -

after changed water at 8.30 am 9 noticed after 20 minutes after 2nd change of water dark colloid floating out all cells, both groups 659 to 670 -

The other 1/2 of the standard solution is quite acid but not far from neutrality - it colors blue litmus distinctly red, but yet decided red - Thus let us to 6x dups of 659 all except the solution which is acid

665 - to 6x soaked in standard acid solution as above 2 hours it is then to be removed + put in water after proper washing they are to be put in 2½% KOH, for several hours + then washed in water + set up for test. 2 to be run dry 2 wet. Thus Soaks for 2 hours

666 Dup of 665 soak 3 hours

after 2nd change water + wash 3/4 hours so much chaff collects comes out that I changed both groups from 10% Conc to 21% KOH + put in at 9.20 am-

	1	2						
670AD	271	291	670BD	217	209	670AW	80	670CW 144
669	310	334	669	104	133	669	113	669 " 98
668	300	313	668	300	299	668	100	667 " 67
667	297	308	667	283	314	667	127	666 " 153
666	278	321	665	30	176	666	127	663 " 77
6								662 68
								661 " 103
670AD	300							660 " 140
69	326	337						659 " 33
68	429	449	458	433.				
67	293							
66	302							

671 group in solution 9.05 am

670AD	2nd run	274	
669	"	333	
668	"	372	
667	"	300	
666	"	300	
664		220	
663	"	271	
661	"	350	
660	"	317	
659		225	
665		140	
662		278	

670BD	2nd 219
669	" 129
668	316
667	315
665	0
664	200
662	327
662	164
660	235
659	122

acw 2nd Rem Mg

667 Dup of 665 soak 4 hours

668 Dup of 665 soak 5 hours

669 " soak 6 hours

670 " soak 7 hours

671 Now take the solutions saved from 659 to 664 and put in 4 m of each + put them on heater taking off 2 3 4 5 6 7 hours soaks + then putting this right in 21% for 6 hours soak hot + change KOH solution twice, then in water

671 - This soaks 2 hours + goes right into KOH after rinsing with water -

676BD 267 – 225
675 " 182
673 " 165
672 " 295 – 255
671 " 183

677 AD 205
676 AD 200
675 " 287 – 285
674 263 – 250
673 213 – 245
672 187
671 A 157

676 aw 119
675 " 118
674 " 67
673 – 50
672 100
671 125

677 group ow at 905 am –
677a – 295

672 Dup of 671 soak 3 hours ✓

673 " " 4 " ✓

674 " " 5 – "

675 " " 6 " ✓

676 " " 7 hours

677 = Solution in which 664 to 670 was soaked – treated same as 671 –
677 – soaked 2 hours

6821 0 - 262
6818 - 50
6818 - 160
679" 290 280
678 320 340

682A 367 - 400 - 413 - 401 - 400 - 403 - 419 - 385
681 " 233
680 " 263
679 " 200
678 295 - 238
677

682 aw 58
679 " 112
678 " 123
677 " 145
681 92

682 aw 180
681 " 130
678 " 105
676 " 172
675 " 72
674 " 72
673 " 162
683 + 684 - Solution to obtain when running in hot plate Crystallizes out; about 1/2 - Gallon -

683 - 2nd

678 Dup 677 - soak 3 hours ✓

679 " " 4 ✓

680 " " 5 ✓

681 " " 6 ✓

682 " " 7 hours

683 = Arsenic acid boiling Conc then 33% KOH added till just a little acid, dark reddish on blue Litmus - put 4 nickels in soak for 7 hours then H_2O + KOH 21% + H_2O again - 2 dry 2 wet

684 - Same as 683 but after soaking 7 hours Rinse in water + put in KOH 21% hot 6 hours then wash -

There may be some mistake in ... Marking bottle strength Arsenic acid to strength of 33% Very syrupy

686-AB- 192
685 " 182
684 " 197
683 " 185

686 RD 223
685 " 160
684 " 195
~~683~~

686 au- 150
685 " 68
684 " 105
683 " 109
682 " 153
685 " 57
684 " 147
683 " 150

685 - Arsenate Potash - used arsenious acid only put in 33% but acid not quite strong enough arsenious - its decidedly alkaline by red litmus - 4 nickels soak 7 hours then Water then KOH 21% then water - 2 wat 2 dry -

686 - 4 ni put in the hot aq used Metaphos K sol which 2 or 3 sats of ni had been soaked in & which is very slightly acid - 4 nits which 1/2 of green ni been in hot for two hours & cold all night - poly fairly saturated with ni - left the nickels in 15 min rinsed & put in KOH, - then water 2 wat 2 dry

687BD 117 687AD 161-212 687W 112
687AW 122 -

Hypophosphite K stained alkaline -
after being on heater 1¾ hours solution
rusty Color at 2 hours stained
gassing like boiling solution
turned gray - it gasses vigorously
688 was colored off about 15 minutes
coffee stained gassing strongly in 2
hours - Hydrolition at 320
in 688 to Acid but not strongly
acid. in 688 the solution was not
cooled but it had no Evidence of Metal
dissolved. The 3rd was hotter to acid -
0582

687 Arsenious acid saturated in
Excess in KOH 21% Even with Excess
acid it is still strongly alkaline -
to this diluted 1½ litre water -
still Excess acid + alkaline -
9 now dilute it so about ¾ H_2O -
Soak 7 hours - then wash then
KOH + H_2O

688 - In 2 hours hot in
Hypophosphite Soda - 1 lb to 500 cc
then in H_2O then KOH 21% then H_2O

689 Dup 688 soak 3 hours

690 Dup 688 soak 4 "

its growing yet shows no trace of nickel. The gray color is due to very finely divided graphite thrown out by the acid probably by internal gassing in the 8 hours one KOH precipitate some nickel of yellow color due probably to Fe mixing with it, Ni at 4 o'clock the Solution in removing bottle quite acid - blue let drop test red.

probably some of the gray color may be due to incrusted or partly reduced Ni in fine state but mostly it due to graphite — Took all the Solution added Nitric then pp by KOH, boiled, green pp not much, then dis in Nitric there was sudden pop in of Red fumes, then neutralized little followed. Solution Clear No sign Nickel but good pp in the Nitric probably from only a small part of the Graphite mainly all the pp in Nitric after boiling shows it quite.

No Ni in the 690 - more Fe than in 689 - There is a very faint trace showing Ni in pockets are cleared a little but are dull + Graphitic even in 692 =

693 AW	342	
692	343	
691	343	
690	357	
689	364	
688	178	

Sed 4 pages above

691 Dup of 688 soak 5 hours

692 Dup of 688 soak 6 hours

693 Dup of 688 soak 7 hours

693 BB	322	693 AD	302 -	693 BW	295
692 "	419	692 "	389	692	248
691	410	691	341	691	296
690	348	690	287	690	353
689	367	689	327	689	315
688	324	Cast	50	688	172
				693	

694 - 1 gm Hypophosphite Sodium 500 cc H_2O — Soak in Cacl 2 hours, then wash then KOH hot 6 or 8 hours then wash

695 Dup of 694 - soak 3 hours

696 " " " 4 "

699- had considerable growth in
The Solution is clear yellow —
No graphite as in hot Hypophosphite
pkg because no internal gassing

Note = If internal gassing is
required Hypophosphite Na is the
best thing to know that —
Pockets of Cold group 694 not cleaned

699 AD	99	699 AB	157
698 "	167	698 "	155
697 "	193	697	156
696	160	696	152
695	233	695	133
694	160	694	172
~~2~~	~~28~~		

700 701 702 - had white flecks off
Cups had a clinging green deposit on wall
mean 2 days - the deposit ~~[illegible]~~ is now
perhaps clean this is not a trace of nickel -
Evidently acetic acid as oxide will combine
to form chromite without the nickel —
probably the Nickel is combined with wool
of KOH hot wire cramp of - then will cause
complex soluble to ~~[illegible]~~ and probably
would now & soften Cu & alo —
all were soaked 16 hours before putting in
lehr —

		Cu
702 BD	280	192
701	167	193
700	80	166
702 AD	132	160
701 "	153	178
700 "	136	173

697 Dup of 694 soak Cold 5 hours

698 " " 6 "

699 " " 7 "

700 — 500 cc water 12 oz Arsenite
Soda — filtered & partly Neutralized by
KOH, it is dark red acid on Blue Litmus.

700 - soaked all night Cold. Then
H_2O + KOH Hot + H_2O

701 soaked all night hot

702 " not so hot

703 from W 1170 ✓

704 from BD 1017
704 " W 933 ✓
703 " BD 890
704 " AD 1000
703 " AD 933
708 W&A 1203 ✓
706 W A 1108 ✓
705 Cups very clean
708 W-B 1170
706 W B 917
708 A 1223

Hypophosphite Na
apparently dust
used above

707 D 151
707 W 115

707 & 708 Dull after 4 hours dont boil or only goo a little —
Cups nearly cleaned

703 – Hypophosphite Na – 1 lb 500cc Grain used once (Cold) – 3 ~~weeks~~ from 6 hours

704 same as 703 but 3 hours in 3 hours on 8 am.

705 ½ strength of above to 703 Hypo in 6 hours 0.3 n/kcals.

706 ½ strength of Hypo 2 hours in 6 hours

707 ½ strength of Hypophos as above having been used once – then added abt ⅓ its bulk of 21% KOH making it decidedly alkaline – 3 n/kcals. 6 hours – on at 830 am –

709 BD	388	413	408-440-288
704 "	1067		
703 "	1000		
709 AD	368	278	
705 "	345	348	
704 "	1067		
703 "	953	327	

708 From wet 1133 - 1240 -
706A " 1053 - 1120
708 B wet 1103 - 1200 -
706 " 893. - 933

709 - Boils Gently on heater 1/2 Hr. Salt Came out flocced with H_2O -
709 at 3 hours after put on was Acid - Cups not cleaned -

Residue when 3 put KOH at quite a long which precip thrown out -
320 - no graphite has come out, only boats a little - Acid still very alkaline -

711 = Lots Nickel Came out
This ppty be Ng -

708 - Dup of 707 but has 2 hrs in off at 3.48 pm

709 - 116 500 cc water - full Strength Neutralized & fully Alkaline Cap 93 1/2 pm 3 Nickels - off 350

710 75 cc of the Standard Hypophosphite Sol 116 500 cc & 25 cc 10% 33% making it very alkaline. Comes off 640 pm -

711 = So aked 1/2 hour obtained Na_2CO_3 dried & then quick dip twice & dried - put in 5 @ 10% HCl - black Came out attacked Ni as considerable in solution but there may be dirt & gas cyst in of solid Ni at bottom of black - Comment only at end - ppty off - only 1 cc 5 minutes, dropped well out in water - Run wet Nickels come pp Coming out post on 50% KOH for hour Minority of -

693B							
92	419	412	390	420			
91	410	420	425	429	438	442	
90	348	358	346	340	342	342	
89	367	372	407	407	400	422	
88	325	342	325	315	322	318	
	2191	2239	2216				

693A							
92	389	413	407	405	412	416	
91	341	343	330	322	327	326	
90	289	295	298	358	367	373	
89	327	354	359				
88	56	56					

693B Wet							
92	295	291	293	291	292	297	
91	288	291	287	293	297	290	
90	296	307	293	290	292	295	
89	353	357	353	342	343	352	
88	319	302	300	307	320	311	
	172	207	208	200	220	220	
	1717	1792	1696	1673	1724	1725	

693A Wet							
92	342	345	345	344	342	343	
91	393	385	352	348	344	343	
90	343	325	296	293	290	298	
89	355	328	323	313	320	312	
88	564	324	337	327	324	324	
	175	200	217	200	219	227	
	1975	1907	1870	1821	1843	1850	

713 Dry 278 - 300 - 293
712 " 245 - 258 Co
711 " 233 242 Co
710 " 132 153 Co
707 151 172 Co
710 W 100 - 132 Co
709 W 257 - 257 Co
707 W 115 - 141 Co
705 W 323 - 347 - 315
704 W 1017 -
703 W 1200

705 W 6th run 322

714 Decanted away NH4 + solution & some recovered which may have washed out of crucible -

712 = Pocket soaked 1/2 hour Conc Na_2CO_3 Dried + put in work HCP 1½ hrs 1 gram ground Conc. Crucible but no 6 Crack Came out, in 1/2 hours a furnace 7th little ~~blue~~ green tint put it in 5% KOH hot for a while,

713 = Pocket soaked 1/2 hour Conc Na_2CO_3 then put - strong glacial hot - Clots gave fumes for several minutes some black when put in hot took out + put in 5% KOH + green pbb soaking - glacial - 10 minutes powder 15 -

714 - 75cc K Metaphosphate, 25cc Ferrocy K Solution, 6 Nickel from cell quarter 39 @ 40 dump on long clamps - soak 48 hours, hot then KOH, then H_2O - The Nickel is a clean Colors Lutum reddish (Ginette) - 3 dry 3 wet,

Very slight yellow tint - 715

719 D	115	146		
718 "	163	212	291-288	
717 "	165	320	256-262 Co	
716 "	220	288	312-317-Co	
715 "	117	152	212 Co	
714 "	87	114	156 Co	

718 wet — 2nd: 165, 113, 106, 133, 126 — Co
717 " — 93, 138
716 " — 217, 229, 299, 247, 193

716 — Quite large deposit bottom bottle, Sol little yellow green tint

715 wet: 133, 150, 103, 127 — Co

714 wet: 83, 92, 65, 45, 53 — Co

717 : Big pp by NH4 - ~~[illegible]~~ ~~[illegible]~~ filtered: no green color dissolved in HCl + pp by KOH, then shows quite an amount of precip possibly nickel — Comes down slowly - guess it is big - Solution originally very green.

718 - Sol clear White flocculent ppt of

719 Sol clear "

715 - 75 cc Hypophosphite Soda - 25 cc Saturated Ferrocy K to soak 24 hours - 6 nickels, Clips from same [illegible] as 714 - Then KOH, then water -
The Hypophos is not acid - - to be in 48 hours hot

---

716 — 75 cc Hypophosphite Soda added Enough 10% Sol Hypophosphorous acid to redden Litmus decided, added 25 cc Saturated Ferrocy K — to be in 48 hours hot Then KOH, then H_2O
6 ni 3 wet 3 dry

---

717 - 75 cc Metaphos Soda used 25 cc Arsenite Soda - 6 ni 3 wet 3 Dry to soak 48 hours then KOH, then H_2O -

---

718 50 cc Arsenite Na soak 48 hours (bot H_2O)
4 ni.

---

719 25 cc Arsenite Na. 75 cc water
4 ni soak 48 hours

720 Sol clear some white floculent,

721 to 724 in solution 2 or 3 hours

Thick deposit of green stiff oil decidedly Cloudy with strong CN smell strong pilot feels heavy —

Large quantity of stiff comes out some Hcn & Co2 — Solution green

Only shade lighter it goes out gas for 2 hours or more finally all goes pilot clear

724 If dilute acid dissolves the acid harshly any gas —

720, 75 Hypophosphite Na 25 sc arsenite Soda Soak 24 hours — then KOH, then H_2O —

721 — Pocket Green soaked sulphuric hot 20 hours cold Conc Na_2CO_3 then put in Bisulfate Na to which is added Ferrocyn — 1 Dry

722 — same as 721 but in Bi Sulph Na and good deal gas — Solution Colloid Black Dot come out gummy a soft end. 1 Dry

723 " but in 3 inch stick Sol of glacial acid — some gas comes out, 1 Dry

724 — Same as 721 in Arsenious acid (hardly any dissolved) no gas — 1 Dry

730 D	283	sc. -188	718 wet	185	185-192
729	358	367-390-378		62	
728	298	342 380-378	717 wet	77	716 wet 188-214
727	217	-		100	258-333-255
726	241	257-280 cc		87	246-328-316
725	312	303-320-299 cc		62	205-255
724	140	169-		98	163-192
723	Split				
721	117		715 wet	78	714 wet 53
720	223	284 327		183	82
				80	35
				83	27
					33

Tested Solutions from 4 cells showing Na Hypophosphite in Reversal (work) but — Concordance not out. probably not 5 milligms of grain picked ammeter of the cells & 12 packets that probably came out miraculously by showing There is considerable work passage

730 graces along as well as 729-8-7-6-5-725
No shock comes out, Solutions at 240 show no test of nickel. They are now acid

725- Standard Hypophosphite Na neutral
1 LB 500 cc water —
½ strength 4 nickels — 6 hours

726 Dup of 725 ¼ strength
4 ni 6

727 Dup of 725 ¼ strength
10 hours

728 - Dup of 725 ⅛ strength
10 hours

729 Dup of 725 ⅛ strength
20 hours —

730 Dup of 725 ⅛ strength
20 Hours —

June 29 1905

The Idea of 731 to 739 is to Cause the acid to Combine with the granular the resultant insoluable, then wash out by long water Soak the sol that treated with KOH. hot 24 hours then wash the sweet the mix to remove the Continual peroxity

732 - green — 733 green -
732 all soaked um grd
733 " "
736 " "

734 only little die - poured out clean Out wood - that —

735 = as black came out plain Put in H_2O put it right in KOH added H_2O_2

" 736 green -

731 - Reg cup Reg mix 3:12
Put in Sulphuric and Ferrocy hot, & to Ge kept 24 hours, then water then KOH. Calliper new 91 100-102 soaked 14 hours hot,

732 Dup of 731 but 5% Solution of phosphorous acid - Calliper new 92 100-102 14 hours soak Heat in water ½ hour Leak off - new acid,

733 Dup of 731 but 20% Solution glacial phos acid - Calliper 93 103-102 14 hours soaked ½ hour hot new acid -

734 Dup of 731 but ½" Picric acid Cal 90 — 98-97 soaked 14 hrs Hot

735 Dup of 731 but ½" Sulphide K. Calliper 96 104-106 soak 14 hours hot

736 Dup of 731 but ½" arsenic acid Calliper 91 98-101 ½ hour hot new acid soak 14 hrs

740 Wet 140 | 263 | 730A wet 213-260
739 " 483 | 491 | 730B wet 158-206
738 497 | 500 | 730C " 217-273
737 440 | 459
736 255 | 256
735 388 | 405 | 729 wet 250-297
734 407 | 413 | " " 317-342
733 372 | 350 | " " 253-290
732 345 | 5C | 728 " " 193-207
731 517 | 507 | " " 197-207

727 wet 5C - 258
" 278 - 294
" 328 - 330

726 wet 317 - 367
" 315 - 327
208 - 200 C

725 wet 242 - 224
283 - 267
338 328

720 wet 263 - 317
233 - 297

719 wet 122 - 157
" 70 - 123
" 5C - 77

739 - 1½ hours hot, 6 al cold
739 is not green —

740 - Sol very black —
put water in + then H_2O_2 to oxidize
the Sulfide of Ni
after pull — in KOH 96, black again
added H_2O_2 when it cleared

740 | 3rd | 332

V 737 Dup of 731 but 1/4" arsenious acid
Calipers 88 - 95 = 97 soak 14 hrs Hot

V 738 Dup of 731 but ½ ferricyanide dark;
Calipers 90 97 - 98 Soak 14 hrs hot

V 739 Dup of 731 but ½ oxalic acid
Calipers 88 — 96-97 soak
1½ hours on hot - Now Cold - 14 hours

740 Dup 731 but in Ammon sulfide
Cal 87 92-91.
to be soaked cold — 14 hours soak Hot

after 14 hours - 741 not quite as much tint,
742 to 745 all growing no tint
746 - green - 747 clear
741 most development 742 some blackened - 743 1/2 blackened
744 - little red 745 - scarcely any red - that dirty white -

Phenomena - 741 cups not cleaned
but 742 - 3 - 4 & 745 cups cleaned but
not to as bright a clean shade uniform
Clean - 745 is as good as the others -

741 to 747 was on KOH. on heated
from Saturday Particle Monday Am 9.

746 - turns white + gives precip when stirred
up - possibly Oxalic Acid most
of oxalate K formed solution not very sol

747 Don't give the precip -

741 = Standard Solution of Hypophosphite
of Potassium. 1 lb to 500 cc
741 is full strength. 3 ml all wet.
15 hours

742 Dup of 741 Half strength 3 ml

743 " Quarter strength 3 ml

744 " One eighth strength 3 ml

745 " one sixteenth strength 3 ml

all 15 hours on at 6 P.M. afternoon to KOH 16 hours

746 - 1/2 strength Hypophosphite Potassium
by filling bottle 1/2 full of full strength
then adding along Dol. Oxalic acid till
3/4 full + 6 dol water - 3 ml 16 hours

747 1/4 strength or bottle quarter full
of full strength Hypophosphite K, then
added along Oxalic till 1/2 full
(balance H_2O — soak 16 hours

Notice that Na Hypophosphite Cells gas after one 1/2 hours but

* Potassium Hypophosphite dont gas after 6 hrs or one hour + 1/2 =

There must be a difference between the two —

* K Hypophos after 5 hours gas all right but not as strong as Na Hypo after 1/2 hour —

after 24 hours 748 49 + 750 gassing a little 748 has considerable black sediment 749 a little white sediment 750 no sediment — no test in either —

Note = 748 49 - 52 - white flocculent in bottom no graphite - Cobalt ores 751 52 + 53 has graphite in bottom —

I may have got numbers wrong on 751 2 + 3

751 to 753 after 24 hours no gas come off Sol not tinted 751 & little sediment - bottom 752 - still less 753 none —

K

748 = 1/4 strength of 1 lb 500 cc Hypophosphite Soln to be soaked from 10 am Saturday until the 5th of July - 4 Days - then KOH 16 hours off at 9 am July 5

749 = 1/8 strength Dup 748 off 9 am July 5

750 1/16 strength Dup of 748 - off 9 am July 5

Na

751 1/4 strength 1 lb 500 cc Hypophosphite Na to be soaked till 9 am 5th of July — on 1030 am —

all off Mine AM July 5th

752 1/8 strength Dup 751

753 1/16 strength Dup 751 c

754 - yellow green turbid after 15 hours soak
755 very faint turbid -- " -- "

757 & 758 - No turbidity in soak cups cleared.

754 1/8 strength Merck's Sodium Phosphate slightly acid - 1 lb glacial 5 to 6 cc citric - to whole 4 liters 33⅓
to Soak till July 5th 9 am - on 10:30 am

755 1/4 strength Dup 754 -
754-5 - off 9 am July 5

756 - 1/4 strength Na Hydrogen Phosphate - Soak COLD until July 5 - 9 am
Started 12 Noon Saturday

757 - two old cups been soaking 2 days in Hot Conc Na2CO3 - dried & put in Cell Containing 1/16 thick over bottom of Oxalic acid - in 15 hours

758 - Dup of 757 but 1/8 inch dry over bottom of oxalic - in 15 hours

Monday
put in ~~Sunday~~ 10 am. 3rd

Put in Monday 10 am — 3rd July

759 1/4 strength of Hand and Dal (1 lb 500 cc) Potash Hypophosphate. to soak 10 to 15 hours — then old solution poured out & fresh solution put in & soaked again 10 To 15 hrs. then H_2O & then KOH+ H_2O — put fresh Hypo in July 4th 2 pm off July 5 — 9 am —

760 Dup of 759 but Hypophosphate Soda instead of KPO. Put fresh Hypo K in July 4th 2 pm — off 9 am July 5 —

760 D	248–233	748 wet 313	327–323	340
759 "	232–222	747 "	117–153	
758 D dry	113–127	746 "	67–100	
756 "	235 248–246	745 "	183 207	
755 dry	156–211	744 "	280–293–297	315
754 "	173–210–	743 "	257–252–257	265
753 D	327 367–367–380	742 "	320–333–322	285
752 "	284 292–281	741 "	52–86	
751 "	343 358–355	760 Bwet	255–232–	
750 "	230 267–268	759	183 170	
749	133	758 dry	128–128	
748	320–316–312	757 "	117–128	
758 A dry	128–128	756 "	256 300	
757 "	117–128	755 "	217–212	
756 "	256 300	754	73–114	
747 "	115–125	753 "	325	336–326 328
746 "	162 173	752 "	337	330–317–
745 "	192–200	751 "	255	248–237–
744 "	260 292	750 "	317	348–354
743 "	317–312	749 "	288	293–283
742 "	310 306	748	253	260–278–
741 "	150–167	747 "	47	87
760 wet	278–284–284	746 "	113	152
59 "	260 233–223	745 "	203	222
56 "	257–279–278	744 "	262–276	
55 "	73–106	743 "	262–258	
54 "	98 116	741	40	77
53 "	278 292–294			
52 "	343 342–340			
51 "	312 297–283			
50 "	217 251–253			
749 "	313 323–324			

For large Cells –

Use 1/2 Strength Hypophosphite Na
20 hours soak – This is probably best so far but on account of small quantity per pocket perhaps best to use full strength on one + 1/2 on the other –
Dal 2 Gs NaPO 1000 cc water full strength

761 = 1/2 strength Hypophosphite Soda. In large beaker 10 nickels in put on iron plate directly not on the asbestos – to get higher temperature to leave on all night on 5 pm off 10 am next day
at 6:30 pm boiled over had put on asbestos for the night
the morning at 10 am soaked water out fresh solution put – KOH right on iron soft iron rod
762 1/4 strength – put on heater in same way & same time as 761 – 10 nickels –
On 5 pm off 10 am next day –
at 6:30 pm not boiled over leaves it on iron all night
put boiling water in the night
Started time as 761 & KOH

761-CD	337
761 BD	282
762 BD	297
762 BD	220
762 AD	193
762 BW	298
762 AW	250
762 BW	302
762 DW	261
762 CW	227
762 BW	255
762 AW	230
761 CW	258
761 AW	322
761 BW	312
761 DW	98
761 CW	305
761 BW	305
761 AW	307

763- 3 nickels from 761 lot dried on heater and put in frames without recorrugating or pressing

764- The 7 nickels from 761 put in wet - that dried on heater,

765 3 nickels from 762 lot dried on heater & put in frames without Corrugating or repressing

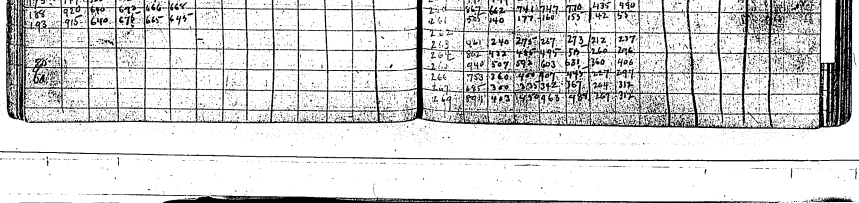
766 - The 7 nickels from 762 lot put in wet,

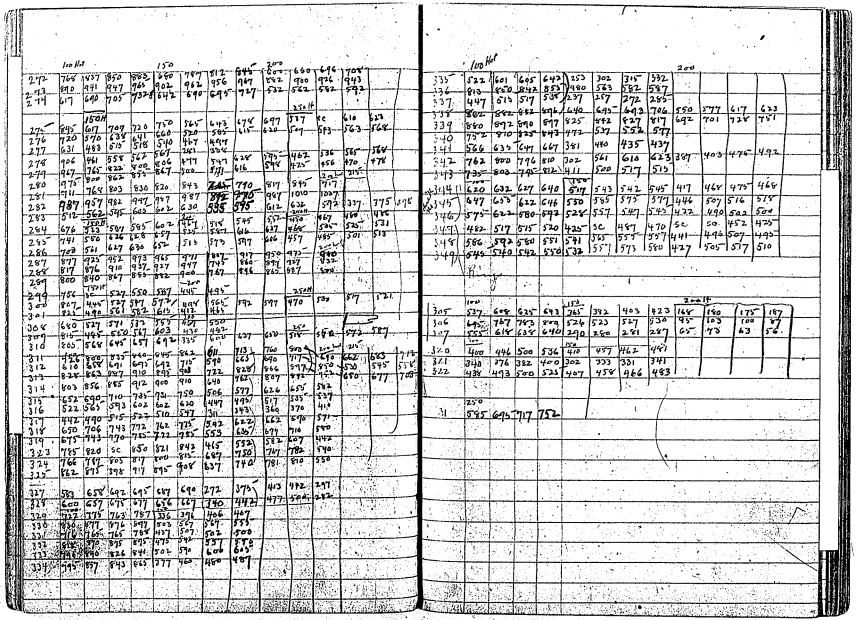
761 A Dry	337	373	362	
" B Dry	282	267	277	
762 A Dry	193	245	250	
" B Dry	220	303	325	
C Dry	297	340	336	
761 A wet	307	295	278	
61 B wet	305	302	269	
61 C wet	305	313	303	
761 D wet	98	168	162	
761 E wet	312	322	310	
761 F wet	322	322	X Low	
761 G wet	256	282	258	
	271			
762 A wet	230	273	277	
762 B wet	285	285	288	
762 C wet	227	290	300	
762 D wet	261	302	305	
762 E wet	302	315	313	
762 F wet	230	265	258	
762 G wet	298	352	350	
	260			

7 | 18 23 7 | 8 0 1
260 | 27

350 - - -

10	528		515	552
12			726	753
13			415	445
14			375	382
15			216	218
16			345	365





* They were called that when 100 Cold runs before first test,

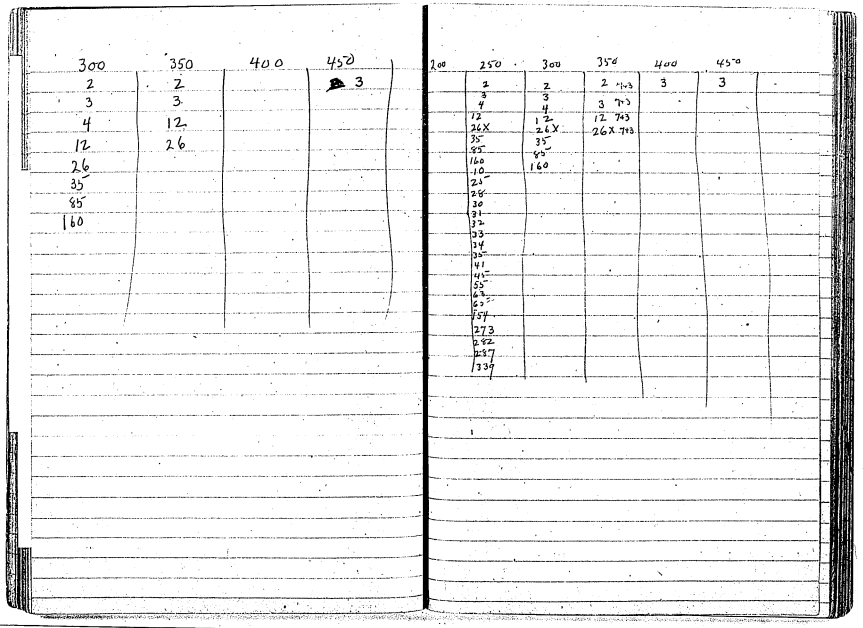
	Hot 400			
63	95	95	122	140
65	130	145	167	176
70	not 8e	350	not	e
210	316	335	381	388
211	296	298	332	337
212	318	330	372	375
218	606	695	677	676
219	486	462	516	515
221	383	406	435	432
225	500	530	568	573
226	423	451	492	506
228	400	420	457	468
230	455	481	512	523
234	833	847	850	852
235	541	581	615	635
236	581	618	658	668

* Sent for three rounds it acted open [illegible] this —

	400			
83	418	440	470	490
85	370	417	425	450
89	32	80	377	385
281	350 580	580	597	553
287	959	960	990	997
287	783	787	783	800
288	617	687	695	703
289	532	590	596	623
314	510	563	580	577
315	430	435	457	471
316	423	441	440	447
317	281	295	297	302
318	373	392	398	415
319	377	427	430	447
323	306	363	357	376
324	344	407	422	438
325	353	411	402	441
327	181	235	222	236
325	118	151	155	167
141	366 400	404	417	452
155	527	555	574	602
162	537 530	581	617	638
237	435	482	466	480
233	544	585	615	622
239	425	512	527	532
241	357	377	400	446
244	330	352	371	387
246	212	242	255	277
250	299 300	312	325	340
304	35	36	33	17
306	10	8	12	6
307	16	10	12	7

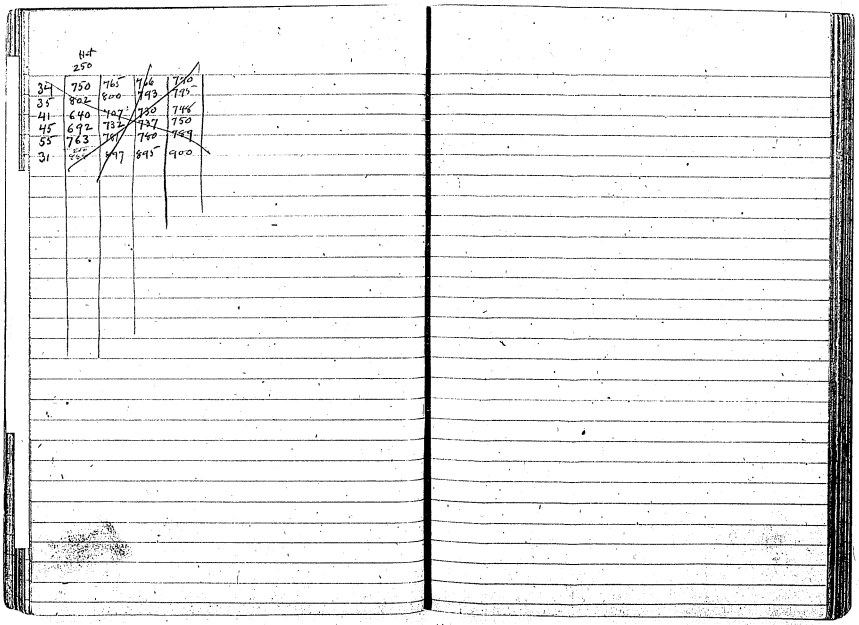
** Req mvp 3.2g Corrugd 250 atmos.

	5MP			
1/4	382	480	430	455
1/2	392	412	417	448
1/16	575	632	635	650
1	447	530	530	597
3	350	332	365	350
5	389	430	432	454
	250M			
272	500	535	532	560
273	573	912	912	917 (not optimum)
274	408	432	422	422
338	450	520	495	511
339	665	732	727	sc
342	350	436	412	442
344	447	467	455	447
345	472	520	492	500
346	464	495	490	490
347	235	7	272	315 not fit.
348	436	470	460	477
349	382	435	430	450
	500M			
1151	495	515	506	513
11	484	508	506	505
12	462	492	482	492 **
13	478	507	500	507
14	425	498	452	455



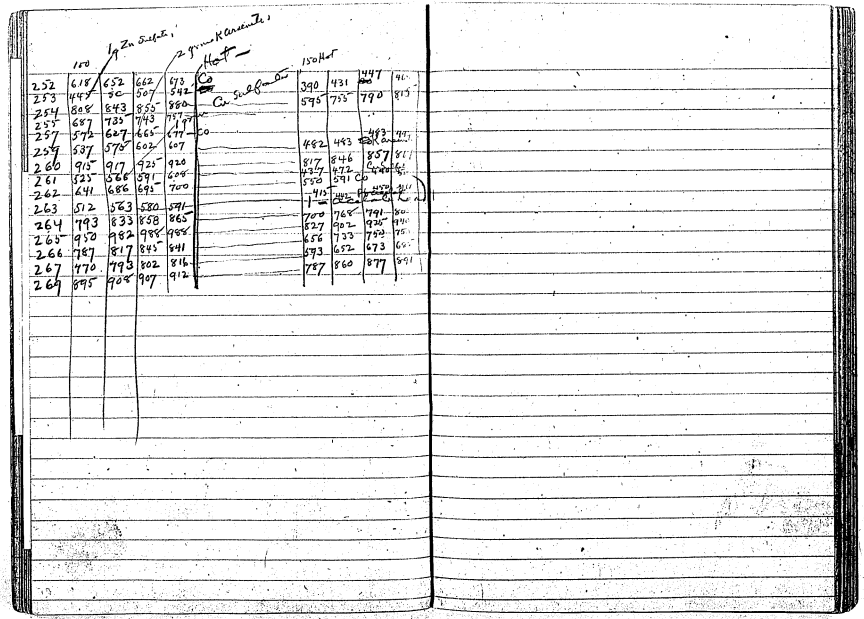
300	350	400	450
2	2		3
3	3		
4	12		
12	26		
26			
35			
85			
160			

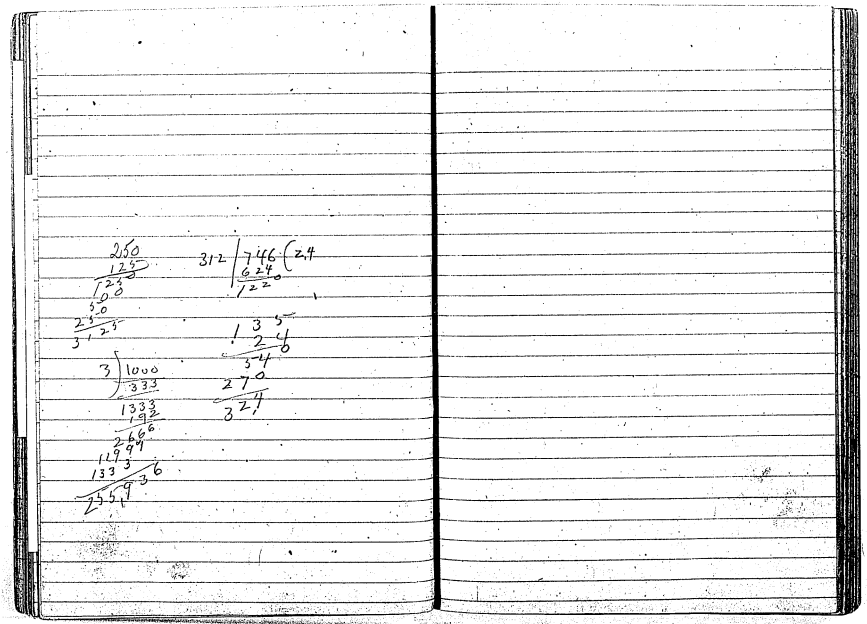
200	250	300	350	400	450
	2	2	2 ×3	3	3
	3	3	3 ×3		
	4	4			
	12	12	12 ×3		
	26X	26X	26X ×3		
	35	35			
	85	85			
	160	160			
	10				
	23				
	26				
	30				
	31				
	32				
	33				
	34				
	35				
	41				
	45				
	55				
	62				
	63				
	67				
	273				
	282				
	287				
	334				



	5-0 Hrt				100				
275	835	847	843	840	781	820	836	845	
276	733	770	770	771	640	691	710	720	
277	663	673	685	680	557	605	625	601	
278	1010	1011	987	982	916	912	905	906	
279	990	990	967	958	965	970	966	967	
280	975	992	982	976	901	957	971	973	
281	762	873	886	912					
282	910	977	978	977					
283	617	723	720	750					
284	633	658	665	660	632	660	675	676	
285	730	736	725	728	682	723	736	741	
286	717	728	722	723	645	681	700	700	
287	925	987	983	976					
288	860	967	972	972					
289	790	887	847	917					
299	838	895	913	921	625	703	747	756	
300	842	893	882	891	668	762	792	807	
301	826	867	896	892	668	770	807	823	

	50 Hrt				100			
308	727	753	772	770	555	635	667	660
309	812	842	883	847	720	780	805	815
310	847	833	858	845	745	792	802	809
311	820	895	892	892				
312	657	767	770	765				
313	850	897	892	890				
314	836	80	903	907				
315	686	776	777	787				
316	542	640	681	685				
317	600	650	648	677				
318	735	830	832	847				
319	727	797	800	817				
320								
321								
322								
323	696	936	930	925				
324	771	859	860	857				
325	883	937	936	942				
326								
327	832	913	916	922				
328	666	735	700	635				


1% Zn Sulf.
2 gm KCl
Co
Cu Sulf
Co
150 Hot
Co
Co
Co
Co

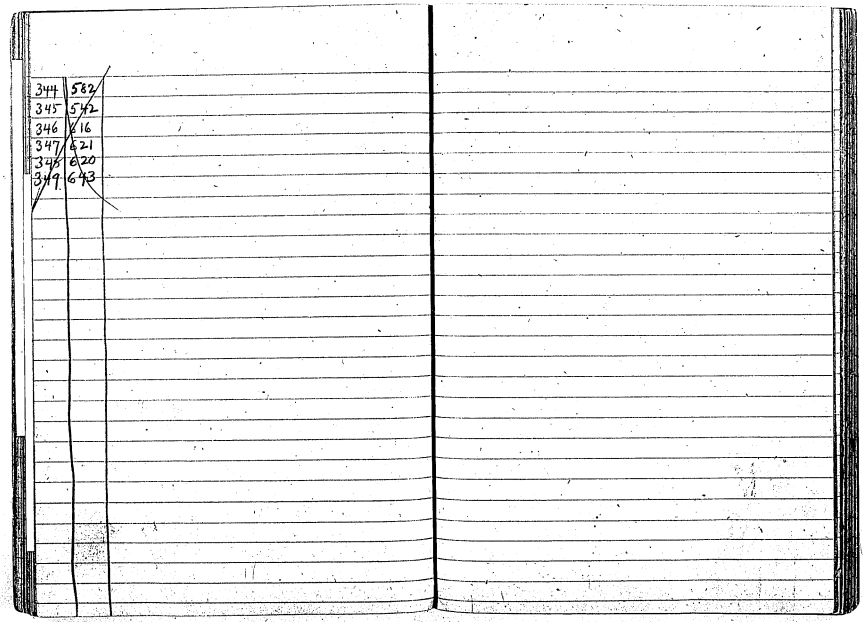


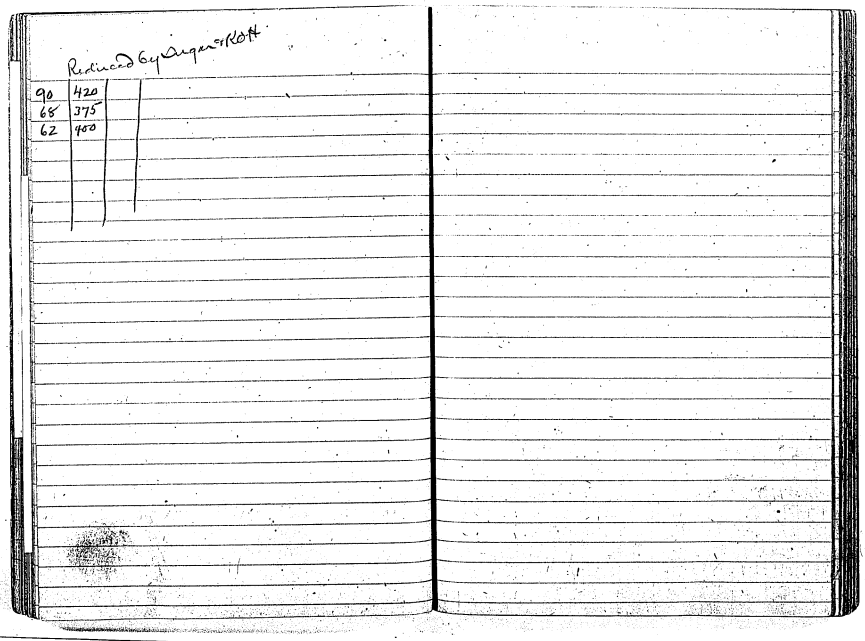
NOTE

Record of condition of Cut out cells that have been long time on hot test,

V184 – pulled out 2/3 of length for each 1/32 open
V163 opened up nearly whole length 3/4 each opened 1/32
V175 " " 1" 1/32 bottom 20/000 nearly to end
V182 " same as 175
V156 " " 1/16 = 2/3 of whole length – Very bad
V187 " up very little – about 004 for 1 inch –
V166 " " 2/3" length 1 1/4" opened 1/32
V169 " " 1/2 inch 10/000 bottom very little say 002.
V180 " " Very little 1/2 inch 002 bottom 001
V167 " " 1 1/2 about 1/32 taper open nearly to ends
V181 " 1 1/4 opened 1/16 – taper open to ends
V190 " 1" opened 40/000 1/2 inch on bottom end not opened
V186 " 4/5 of whole length opened 1/16 almost straight up
V171 " 1 1/2 opened up 004 "
V172 " 1 1/2 " 1/32 1/2" on bottom not opened
V174 " 2" " 008 "
V177 " 1 1/4 " 1/32 "
V170 Very little opened up any place 005 for 1/2"
V176 " 2 1/2" opened up strongly Very bad
V155 " 2 1/2 " 20 To 10/000
V157 " 2 1/2 " 1/32
V164 Bottom to be opened up – perhaps 1/2 open 002 in
V165 " " " "
V163 Opened up 2 1/2 about 10/000
V192 " 1 1/2 opened up 1/32

NOTE


344 582
345 542
346 616
347 621
348 620
349 643


Reduced by Sugar & Roff

90	420		
68	375		
62	400		

	166 Run				200 Roll				
78	672	686	620	765	585	665	672	Co	
80	597	615	595	692	492	515	Co		
83	742	762	687	842	645	757	752	777	
85	850	850	750	911	772	872	875	880	
86	440	467	376	550	425	502	Co		
87	422	483	353	582	476	555	Co		
89	792	808	643	875	650	768	790	815	
93	777	775	743	SC	777	855			
96	627	662	628	482	682				
107	675	667	635	480	675	572	606	691	Co
108	940	912	877	685	915	695	717	770	765
109	575	587	570	397	602	496	522	550	Co
110	650	721	713	512	760	585	635	680	671 Co
117	607	625	605	440	652	900	432	492	Co
130	710	676	683	507	722	532	582	626	612 Co
131	620	597	635	450	670	715	SC	525	Co
135	845	900	900	883	867	537	595	Co	
140	775	875	868	850	775	825	837	813	
141	857	940	950	932	855	897	937	917	
144	573	702	700	687	503	562	610	592	Co
145	555	695	692	687	585	622	650	673	Co
147	678	840	847	826	582	641	670	652	Co
149	592	750	760	737	757	750	773	742	
151	600	692	690	675	510	558	550	Co	
152	597	815	807	800	633	700	733	710	
154	602	847	900	885	796	737	817	852	
158	548	750	758	740	595	627	667	Co	
159	465	697	695	677	538	571	553	Co	
160	720	944	953	925	892	918	955	937	
165	744	797	760	672	635	653	673	652	Co

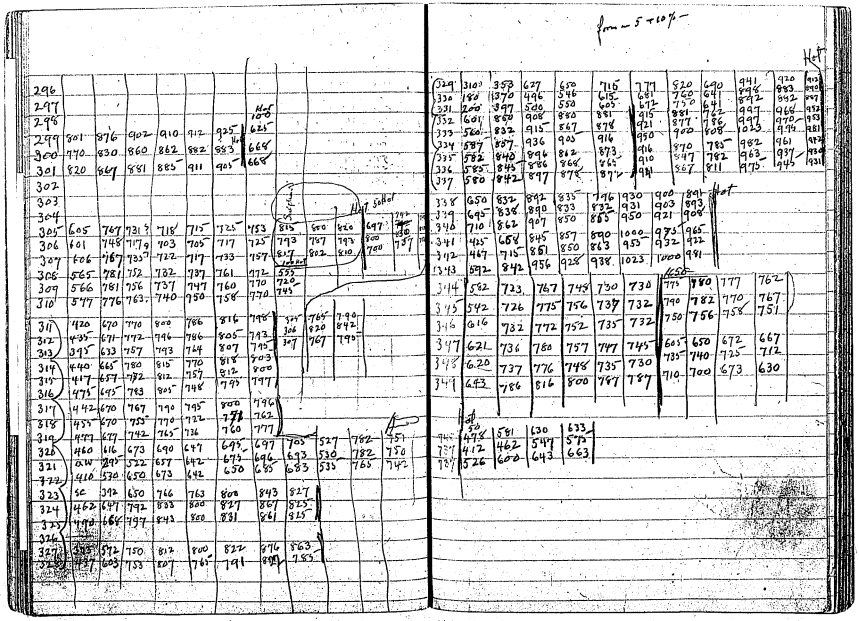
	166 Run				2nd				
173	540	745	800	772	696	732	777	747	
178	550	752	755	712	520	746	517	Co	
179	617	837	842	817	605	577	620	Co	
185	466	708	708	686	457	492	512	Co	
188	628	910	908	895	903	918	947	920	
189	580	807	812	787	637	657	677	630	Co
191	507	775	782	770	612	675	657	Co	
193	670	892	892	865	896	913	981	915	

	180	200				
93	777	613	676	700	682	CO
94	CO					
95	CO					
96	627	493	543	585	CO	
97	CO					
98	CO					
99						
100						
101						
102						
103						
104						
105						
106						
107	675					
108	940					
109	830					
110						
111						
112	647					
113						
130	745					
131	880					

Scooter Finish
finished 25 yrs with
very little wear.

Sunset Trail
Annapolis Park
finish

	50				
329	950	950	943	927	
330	935	947	947	941	
331	750	822	850	856	
332	955	966	962	955	
333	900	925	925	917	
334	960	972	967	958	
335	850	900	908	906	
336	895	908	905	900	
337	661	750	760	767	
338	917	920	918	915	
339	937	925	922	917	
340	932	928	927	923	
341	720	733	738	735	
342	900	890	877	865	
343	989	972	952	932	



Note-Warren m plating Co

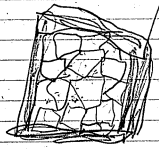
Cake or Drum -

Uses 160 amp 10 Volts -

Cobalt is 3.7 amp per □ sqr Decimeter

Cobalt Solution about 2/3 Conc - Cold

With Zinc Use 7 amp per □ sqr Dec



132	405	460	492	
133	450	502	537	
134	467	491	510	
135	521	550	565	
136	500	553	555	
137	472	578	560	
140	787	820	543	
141	828	863	880	
142	521	530	573	
143	600	670	665	
144	653	700	721	
145	700	750	730	
146				
147	793	836	863	
148	421	435	450	
149	782	767	815	
150	550	587	613	
151	677	717	726	
152	737	796	812	
153	530	567	587	
154	805	835	845	
155	582	637	637	
156	659	690	690	
157	475	537	553	
158	677	731	732	
159	641	700	720	
160	543	565	1827	
161	518	610	592	
163	447	501	521	
164	400	462	471	
165	500	563	568	
166	400	415	421	
167	527	582	595	
168	658	700	710	
169	543	590	595	
170	488	550	580	
171	587	613	667	
172	425	466	508	

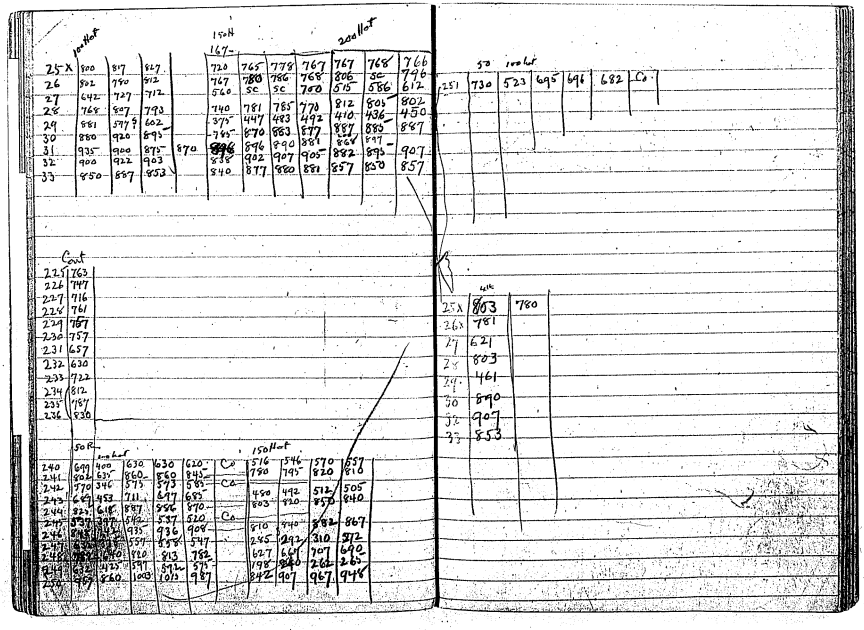
173	748	770	770
174	452	513	547
175	531	575	620
176	357		
177	580		
178	748		
179	720		
180	310		
181	472		
182	561		
183	426		
184	458		
185	620		
186	517		
187	592		
188	777		
189	648		
190	511		
191	612		
192	450		
193	812		

50

2/2	891	940	952	961
2/3	952	957	960	957
2/4	691	733	780	785

Concentrate from Dillsburg Mine
Lingneckei — 18% Tails 82% magnetic
The Tails are nearly all pyritics,
there being very little gangue in the
ore sample used — Sample was taken
from a shipping ore pile of 10 Gallon
Chain run of mine, which averages
43 shipped — The Crushing
was thro 50 mesh — & next
divided Conc into 2 samples
& put one thro 80 mesh
the other thro 100 mesh
to see if more pyrites can
be got out —
The original Tails weighed
21.650 grms after Conc on glass
Weighed 14.270 grms —
or 14.7% of pyrites in the ore
Say 14% —

	25 Sulfur			
28	687	695	730	738
27	806	805	778	796
27	755	540	575	582
28	709	742	720	757
29	833	360	385	377 Co
30	725	911	850	853
32	788	663	890	887
33	757	817	888	835

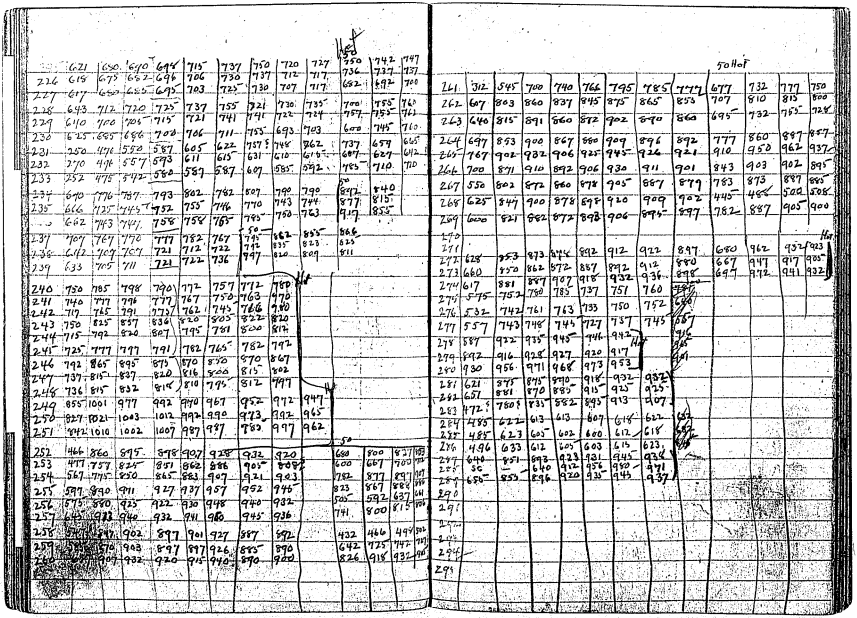


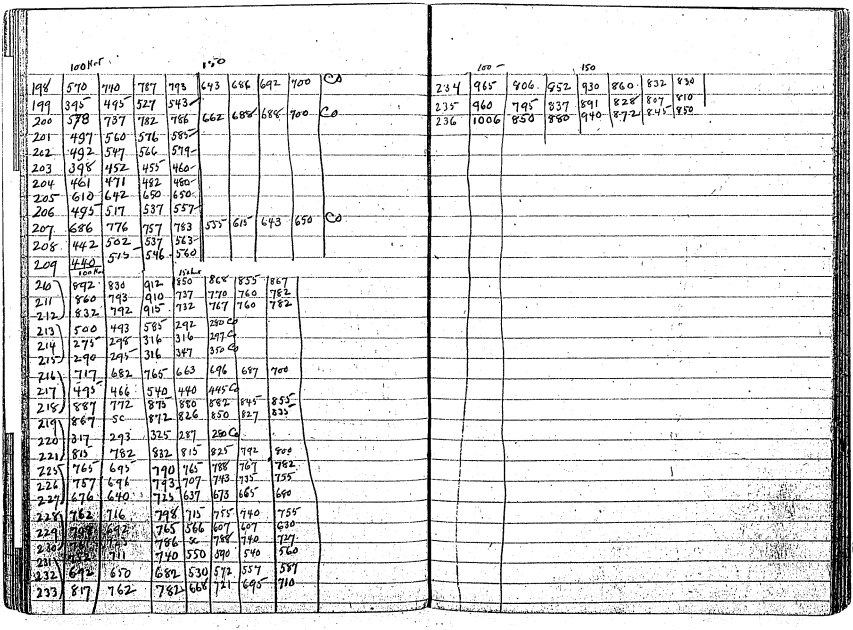
Continued from page XX

	Cut	roofs			150				200		
34	772	615	740	750	777	807	800	7797	792	820	823	821
35	777	620	747	787	785	817	811	812	792	824	828	sc
36	711	537	561	570	600	447	527	540				
37	756	626	637	644	663	503	587	598	600	481	sc	586
38	510	280	267	267	306	175	217	215				
39	777	642	667	664	672	677	675	677				
40	672	642	670	642	654	537	667	613	687	800		
41	867	882	892	830	815	842	837	845	816	795	880	810
42	747	521	575	587	573	418	492	sc				
43												
44												
45	762	747	740	737	717	760	766	770	742	758	770	775
46												
47	776	587	592	595	590	sc	470	496				
48												
49												
50	550	10	550	530	497	sc	472	480				
51	500	430	417	420	404	287	280	283				
52	532	430	427	390	406	sc	320	330				
53	687	665	635	637	621	582	548	611				
54	787	783	745	742	725	728	735	745	740	548	597	622
55	842	800	775	775	760	800	793	797	792	820	831	827
56	287	292	374	260	223	305	340	347				
57	855	697	715	722	717	538	617	sc	608	437	473	502
58	695	465	540	550	5744	365	420	480				
59	786	835	850	843	800	808	832	685	697	685	687	
60	794	790	800	787	792	812	830	572	603	607	607	
61	445	4447	447	471	290	295	290	235	245	Co		
62	1481	486	540	500	Co	Co	Co	Co	Co			
63	870	852	877	862	916	902	920	887	895	875	880	
64	1430	1470	Co				Co	Co	Co			
65	794	587	906	810	730	903	910	762	796	792	812	
66	832	817	837	825	787	790	810	563	587	600	612	
67	632	617	615	610	380	412	433	360	371	Co		
68	1	1	1	1	1	1	1	1	1	1		
69	1	1	1	1	1	1	1	1	1	1		
70	1	1	1	1	1	1	1	1	1	1		
71	1	1	1	1	1	1	1	1	1	1		

	roofs			150 Hot		200 Cut				
72	Sample			Co						
73	241	213	205	187	Co					
74	366	320	297	287	Co					
75	460	465	520	510						
76	832	839	850	842	sc	695	835	573	653	Co
77	650	686	697	707	598	563	568	500	530	Co

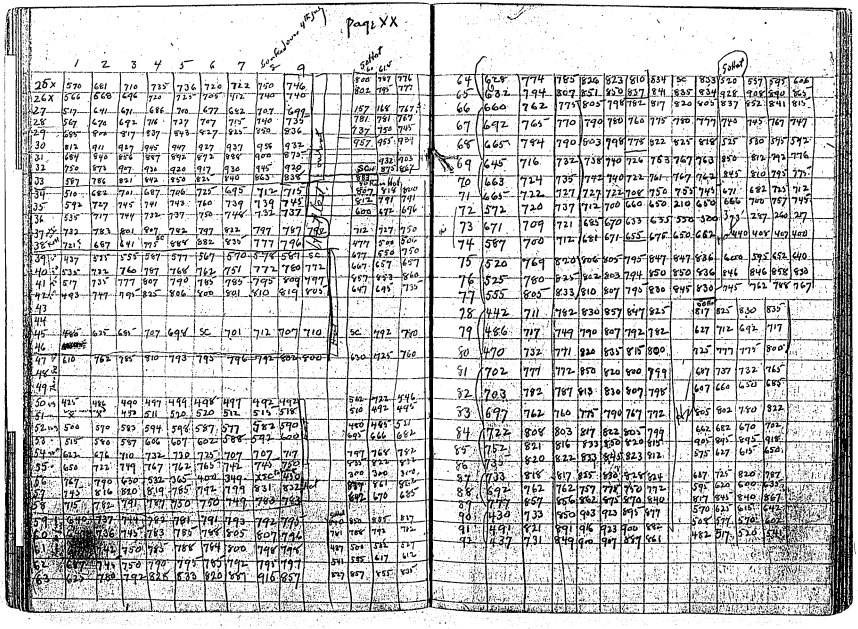
	Hot 200	
34	800	
35	817	
37	547	Co
42	812	
45	770	
54	637	Co
55	847	
57	530	Co

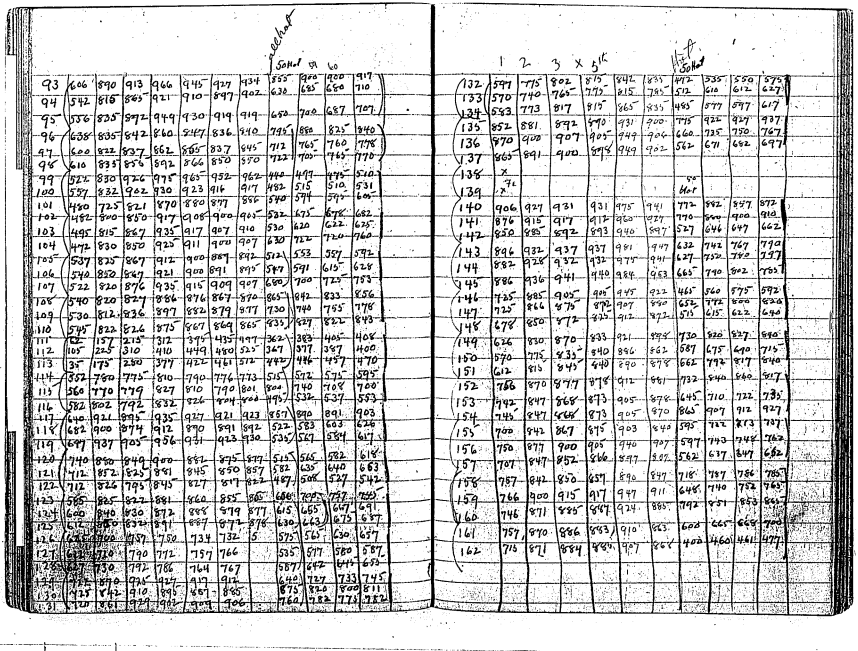




	100 Hor				150				
198	570	740	787	793	643	686	692	700	C
199	395	495	527	543					
200	578	737	782	766	662	688	688	700	C
201	497	560	576	585					
202	492	547	566	579					
203	398	452	455	460					
204	461	471	482	480					
205	610	642	650	650					
206	495	517	537	557					
207	686	776	757	783	555	615	643	650	C
208	442	502	537	583					
209	440 100 Hor	575	546	580					
				150 Lor					
210	892	836	912	850	864	855	867		
211	860	793	910	737	770	760	782		
212	832	792	915	732	767	760	782		
213	500	493	585	292	250 C				
214	275	298	316	316	297 C				
215	290	295	316	387	350 C				
216	717	682	765	663	696	687	700		
217	495	466	540	440	445 C				
218	887	772	875	880	888	845	855		
219	867	SC	872	826	850	827	833		
220	317	293	325	287	250 C				
221	815	782	832	815	825	792	800		
225	765	695	790	765	788	767	782		
224	757	696	793	707	743	735	755		
227	676	640	723	637	673	665	690		
228	762	716	798	715	755	740	755		
229	798	697	765	566	607	607	630		
230	786	745	786	SC	788	740	727		
231	852	711	740	550	690	540	560		
232	692	670	682	530	572	557	587		
233	817	762	782	668	721	695	710		

	100		150				
234	965	406	952	930	860	832	830
235	960	795	837	891	828	807	810
236	1006	850	880	940	872	845	850





Hot leal. 50 hot

163	715	850	850	860	887	825	520	600	608	642	
164	665	812	840	840	863	828	450	513	533	557	
165	650	830	850	872	905	863	590	587	618	661	
166	697	820	731 5	842	816	835	470	550	567	605	
167	670	808	729 5	832	812	830	537	617	640	685	
168	720	855	875	883	920	881	607	710	736	757	
169	702	828	845	850	887	847	550	647	663	710	
170	652	797	815	823	865	832	532	635	665	713	
171	633	807	843	850	891	856	497	570	586	628	
172	670	805	836	832	875	895	477	610	635	670	
173	662	790	820	822	866	832	731	772	782	800	
							635	712	712	747	
174	663	765	809	815	887	825	483	567	592	612	
				817	859	827					
175	667	770	810					50 Hot			
176	757	807	834	833	817	807	817	565	650	640	665
177	745	776	806	795	760	762	777	647	715	700	725
178	732	764	775	768	767	750	759	792	810	767	781
179	737	775	791	796	787	785	792	712	727	746	773
								538	625	610	637
180	725	757	778	783	767	757	765	603	675	655	681
181	725	759	777	785	772	762	775	642	712	695	713
182	695	735	755	761	750	712	750				
183	670	721	735	740	736	725	735	576	637	641	662
								537	615	600	625
184	672	737	752	760	747	711	747	680	735	710	726
185	660	690	705	712	700	697	705				
186	682	725	741	747	740	732	737	600	682	663	681
187	675	710	725	733	735	717	725	655	730	705	720
188	687	717	736	743	730	725	735	775	825	785	790
189	662	691	770	717	697	692	697	713	782	737	747
190	670	702	721	730	727	700	715	685	760	723	740
191	652	749	770	775	765	757	766	731	780	750	778

50 hr

192	677	755	775	782	767	757	762	607	692	682	710	
193	675	762	785	792	780	772	780	785	795	783	800	
194	77	87	105									
195	57	80	43									
196	67	77	98									
197	43	53	43						Hot Salt			
198	862	935	997	993	993	991	995	1000	896	950	940	932
199	825	980	985	985	972	962	950	968	705	751	759	753
200	855	917	980	979	981	977	968	982	891	945	934	920
201	640	695	720	732	722	723	720	710	580	590	605	605
202	625	675	687	695	682	677	658	685	630	645	642	645
203	605	650	655	678	660	647	628	662	467	487	496	490
204	640	700	716	727	712	713	670	695	540	572	555	550
205	630	675	690	700	682	679	652	676	618	645	645	647
206	602	653	655	665	663	660	617	645	595	625	619	617
207	860	962	1010	1010	1003	1000	990	1012	715	790	767	752
208	740	905	950	957	957	955	942	962	530	580	587	686
							880	877	600	650	641	632
209	652	842	900	895	892	890			50			
210	795	967	970	967	955	983	997	1005	921	926	950	945
211	812	947	911	949	941	968	982	987	895	900	921	920
212	785	945	938	950	937	963	995	990	894	900	926	925
213	730	877	932	992	1027	1076	1098	1097	904	975	1017	1020
		1038	1028	1020	1033	1052	1060	1051	577	549	612	617
214	[illegible]											
215	867	1022	1030	1027	1050	1065	1077	1067	650	750	777	781
216	710	805	803	802	796	810	827	827	795	785	795	800
217	715	781	778	776	766	777	798	807	635	630	647	685
218	690	755	750	753	740	754	777	786	816	767	772	777
219	723	785	770	767	766	773	790	803	801	775	778	780
				770	770	780	797	806	437	442	445	450
220	711	773	772			733	752	763	727	722	725	732
221	691	745	730	726	720							
222												
223												
224												

All experimental tubes to be nickeled in the high temp-also plated previously in strip with 70% Cu 30% Ni —

flake used thro 20 mesh

June 21 1905 Tube tests.

Screen green through 20 on 180 - Dry + when dry moisten with slightly acid standard Metaphos K Sol'n Keep under cover warm for several hours then wash with water to abstract dissolved Ni - dry & make in Tubes 7 & 3 flake Ni Cu alloy - The idea is that the particles will be made more porous by solution ultimately the high viscosity preventing

2000 X Circulation - 5 tubes 21%

2001 X ditto deadly acid - 5 tubes 21%

Put in Molasses standard slightly acid Metaphos K saturated with nickel - percolate out in 5% KOH

2002 X at 1st afterwards 1½ 5 Tubes say 1/2 Molasses 1/2 Metaphos

the idea being that the precip $Ni(OH)_2$ will accrete, make Getter Contact. The tubes are to be dried after percolating + then Corrugated just before - all round corrugated, 21%

Dup 2000 2001 & 2002 but Corrugate before percolating -

2003 X Corrugated all around before percolating - Dup of 2000 - 21% 5 tubes

2004 X Corr all around Dup of 2001 5 tubes 21%

2005 X Corrugate all around Dup of 2002 X 5 tubes 21%

all above 20 on 180

flake used thru 20 mesh

2006 X Reg flake 7 & 3 + malasses. 20 on 180
Corr all around before percolate
5 tubes 21% flake thro 20

2007 X Reg flake 7 & 3 + malasses 20 on 180
Corr all around after percolate
5 tubes — 21% flake thro 20

2008 X ~~Dup~~ of 2006X except
20 on 30 mesh 21% flake thro 20

2009 X Dup of 2007 except 20 on 30
21% flake thro 20

2010 X
Dup of 2006 except flake through
10 mesh

2011 X Dup of 2007 Except flake
thro 10 mesh

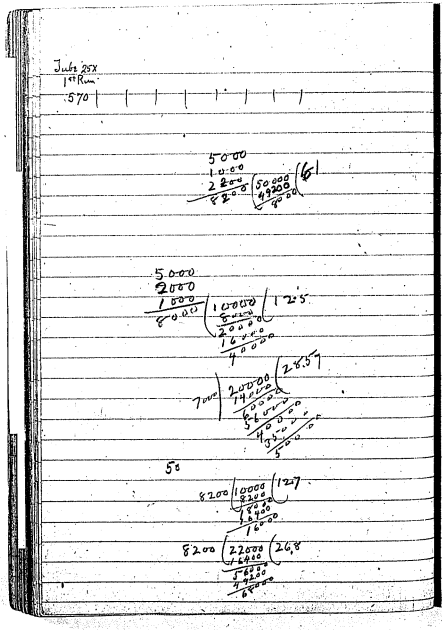
use just enough to cover it —?

2012 X 20 on 180 soak in slightly
~~acid~~ Standard Meta Phos K 6 hours
hot then wash Meta out ~~to dry~~ put Mgo, + dump
use with flake 743 Reynolds
Corrugate after percolating —
all around Corrugate.
Idea being to make green partial
more porous internally 5 tubes
21% —

2013 X 10 up of 2012 except.
Coming before percolating —

Mix some Recently prep $Mn(OH)_2$ with the
molasses + cover it — then put in flake —

Mix some ~~Ni(OH)~~ acetate Ni with molasses
Cover green + then flake —



25X

Tube No 25 Edison –

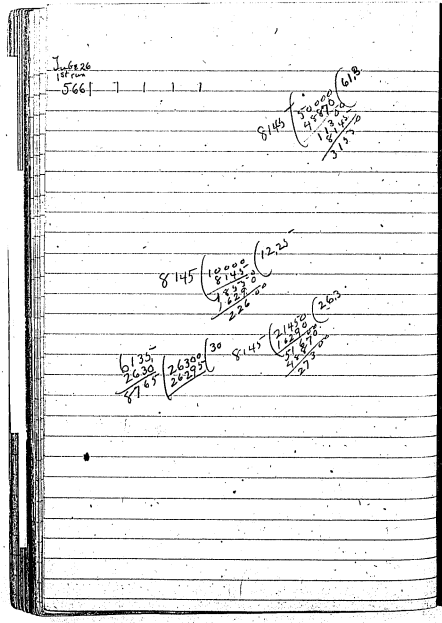
5 000 green thro 20 on 180,
Reg molasses boiled down till thick
1 gram – 2,0005 flake Co Ni 70+30
made by Warren in drum Machine –
5 cleaned thro 20 mesh –
Covering power OK = by using
Molasses very thick it cant absorbed
in pores of ni + covers green ok
but not all the particles are
covered but nearly all –
put some flake in it worked it by
squeezing then added more
+ squeezing in fingers –
not corrugated – 365 Tamp
weight. fall 5" –

Weight active material 5.031
No of Tamps – 41
Caliper – 280 ~~inches~~ thou
Tubes Ni Co plated + tubes welded

3.14 green ~~.285~~ .285 flake

possibly thru was 2,200 flake mix
2,000.

16.6% Mat to green



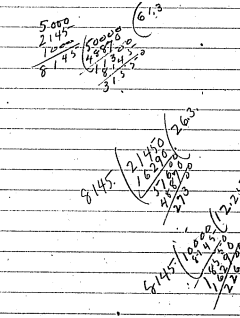
No 26X

Edison Tube 26-X Same as 25
Except 2.145 flake. + the flake
feed put in at once, I think this
is a better way as it seems cover
better not so many free
particles - 5000 green 1,000.
Mol — There are free green in it
but these are particles that
did not get covered with
Molasses. The only thing
now is to find how to cover
all the particles with molasses
& I think that 1/3rd of the
flake can be dispensed with.
3 lbs wt - 5" fall -
Number of Tamps 42
Calliper 280
Wt material wetting 50030
Tubes about plated Cath & needed a
Iron tube welded — not Corr

61.3 g
12.25 Mol
26.3 flake 3.08. green

7 of 3.

Tubes 27
1st Run
517-



Edison Tube No 27-
5000
2 145 Comflake 70/30-
1 000 Very stiff Mixture:
Warmed green + mol - it mixed
+ worked like a dough - put acc
the flake in at once - it was
hard to break clots, after
mixing well, screened it thro
20 found about 20% balls
No sign of green particle

Dust Corrugate,
316 5" Temp -
active material 4.785
Number Tamps 39
Caliper 1.280
Tubes Placed Comm high heat
wrecked -

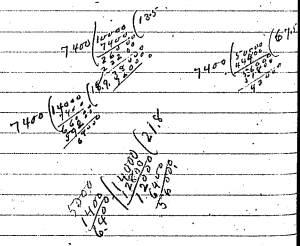
typed pages then # 25 & 26

6[1.3 gms
20 Water
72 Water

293 green

Probably the reason it covers so well is that the little particles attach to the larger ones + thus diminish the surface of that each granule is composed of & several particles which may be a bad thing —

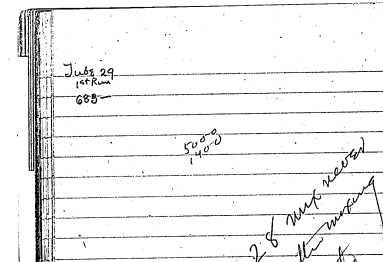
Tubes 28
14 Run
567



Edison Tubes 28

5000 green
1 400 Com plated flake -
1 gram Mal very stiff - over mol
Warm - Malus loose ok - very
sticky dough - Malis smack
amount up flake - Covered
perfect - put all flake in at
once - spread dough out as
much as possible w/ cornflake
put in - only twisted fingers very
gently to break back up - &
finally creamed this 20 mach
then broke little balls up
Comes nicely - then pressed
all hard of a little white,
not a green particle in white
79% Mills 21% flake — Thunk can
Cover with less of flake
Dried longer than 27
Dent Corrug
3 lb 5" Drop 37 -
Calliper 278
Cut deleuematerial 4.675
Tubes plated Corn + Tubes also weeded
3.15 green

Tubs 29
Ref Run
688—



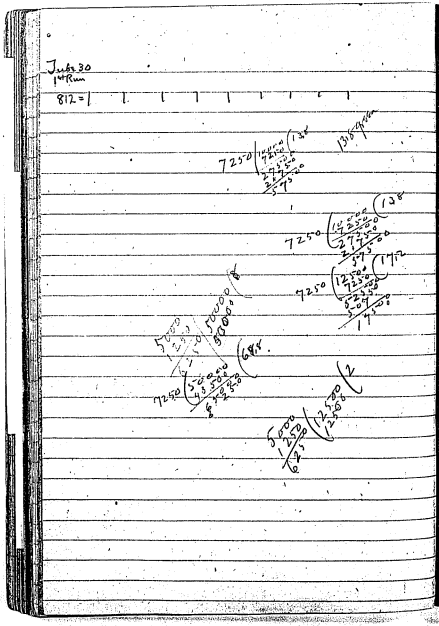
—Meal + grass warm when mixed

Edison tube 29
Not to 6z dried 6 cut put right in Tubs
to test Lubricating properties of
the Mucknalin — Covered
perfect 5000 grass
1 gm diffmd 1400 N Co 70/30 flake —
Worked grass + meal warm — mixed the two
mostly in the little Meal dish before
putting in big dish — got four mix here
6 before transforming — Ilus professor's
way — seemed 6z more actively than
usual powder pressed meals mixtake +
put more meal in but not much
If he died — broke balls up — screened
& then rebroke balls up + powdered
to mesh = Not dried — Covered perfect
Dont Cor — 3 lb 5" drop —
Calliper 280
Weight active material 5.350
Tubes plated welded + tubes welded
Jaups 37
Mut Co

Dried Tubes

1/4

361 grass



Upstairs 30 31 2 3 4
Jan 27

Edison Jubs Nos 30 –

8.2

5000 Green
1250 Nuts 7p/sq flake –
1000 Stiff Mol. green rival warm – sticky dough – Covers perfect – screened thro 20 – some balls worked most thro Balance twisted with fingers broken up stopped green thro fingers pressed them in most of stiff when thro Gucose Coated & no appear to explain micro shows only part of one row thro plastic flake = To be ~~pressed~~ worked out ~~dry~~ – Covers perfect – not corr

Active Material — 5.385
Tamps — 40
Calliper — 279
Corr plated strip welded then tube worked
Not Corrugated —
316 5" drop 20 flake

Jan 18/06
Re-screened + dumps fine on screens
O.K.

3.71 green
3
111.3

Tube 31
1st Run
684 =

Edison tube 31

Dup of No 30 Except to be corrugated all around before soak. Covers perfect

Caliper 270
Weight active 5 235
Jumper 37 =
3" Lb 5" Drop
Strips Not Coated - Welded - Heat tube cracked

3 Lb 5" drop

$\frac{3160 \times 3 \times 2 \pi}{1080}$

Tube 32
1 HP
750

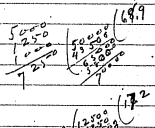
Edison tube No 32 - Same as 30
to be corrugated all around after
Docking + Drying -

Wt material 5.520
Cal 5
Jumps 41 -
McC plated Strip welded - Tubes welded.

3.180 green -
1140

2 lbs 5 dry -

Tube 33
1st Run
5.87



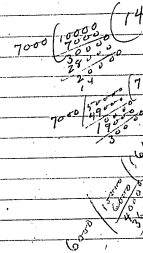
33 Edison tube not corrugated)

5000 grsm
1 250 Flake McCo 70/30 -
1 000 Caramel 2 made, its thin - works cold - it tests warm Thick mol. hot + green hot, makes a dough, ok Covered perfect. not so much baffling when put thru 20 mesh.
Think much less Caramel answer to get buck pressure, used plant it Thurmin - being as liquid poly should go into pores of Mi beads acc is available, it also Extremely sticky, color & Dries - its full of specks, but I could make some good thru redis it Thin-filter & Evap Document proper conversion way - its going to be a winner 1st Chunk - used Caramel -

Weight reactive mat 5.265
Caliper 278
Jumps 41 20% flake
Reg Corn Kneaded Tube -

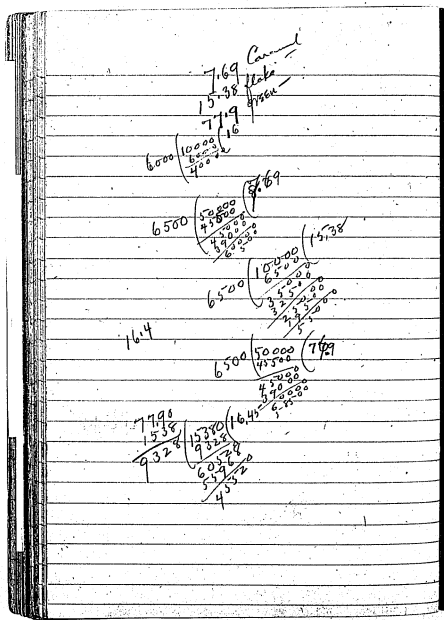
3.685" Drop 3.63 grsm -

Note on 34 - after mixing the sticky as a whole - showing that Lab. Caramel got on the flake —



34 has burrs inside —

Edison tube No 34 (not corrugated)
1 gram of fresh Caramel. Made by using Cocoa oil + Starch at 200 @ 215 Cent in oil + dish with sugar floating - when got ropy ~~#~~ + just melted put water in - then got it to deep red + then took it off it was very ropy coken took off - dried out in Calcium Chloride water say twice it sulk + then filtered it, then Evap it down so that a drop on glass would in 10 sec get sticky & finishing put some in Gelatine marked No 1 - Evap slice more put in Gelatine No 2 + the balance only Evap a little more marked it No 3 - That used in Tube No 2 is No 1. it can be used cold - very much thinner than Molasses it is more sticky
5000 Green 1000 Caramel - 1000 flake
Com 70/30 - Covers OK -
Active material ——— 4.960
Calipers - 276
Tube Com welded short-necked Tube,
Temps 38
3185 Strip 16.66% flake
3.54 grms



No 35 Edison Tube Not corrugated

5000 Green

1000 NiCo 70/30 flake

500 Mdg No 1 Caramel.

This is about the limit for Caramel. It seems to be covered OK - but Caramel gets dry rather too quick - after Covering it feebly acts dry - under Mica scarcely see any green but notice that the flake is rather broken up in small pieces whereas it coats green particles in some cases - think could work with 500 Mdg Caramel if it was a little thinner - as it would Cover better & thickness all right of Con Covering

Wt active material 4.680

Collapse 279

Jumps 37

Tube plated with Co 70/30 welded Tubes welded

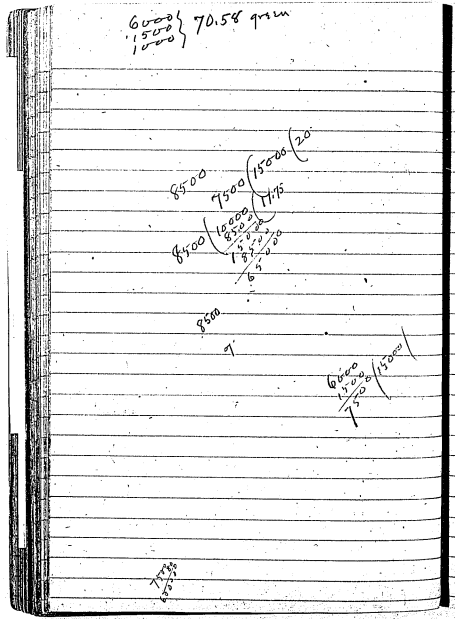
368 5" dump

16.66% flake

7.990 green

15.38 flake - 359 green

7.69 Camel -



36 Edison tubes Not corrugated
6000 grm
1500 NiCo 70/30 flake
1000 No 2 Carmine -
Dayton - Covers ok - considerable balls.
Dry after mixing -

Active material 1.7.7.0
Jumps 40
Caliper 278
Tube at scale Ni Co 70/30 plated Tubes welded

346 5" drop

3133 grew.
20% flake

Intr. 37 Rolled old way using water
6,600 grams
1,500. flake m.Co 70/30. Not coming
Dried before loading

Weight active material 4,768
Jumps 38
Calipers 280
Reg welded tubes,
great amount green rolled very
soft, light pressure — about
same as mixing only.

~~3,626 grams~~
3,181 green
20% flake

Note Tubes from 25X to 38 -
Some may have burs inside &
others outside as I found
34 had burs inside —
When they Caliper note this
all after this (ie 38 will have
burs outside —

The Co Ni 70/30 flake used from
25X to 38 is 72% Co 28% Ni —
There is enough left for many
more tubes —

Tube 38 - Rolled all way used
21% K-Off To wst, Not Corrug
Dried before loading 84.2 flake
Weight Actual Material 52.50
Caliper .279
Jamps .40
Required Tube —
No corrugating power grey green
Color

4.12 green must allowing for K-Off

20
50
75
100

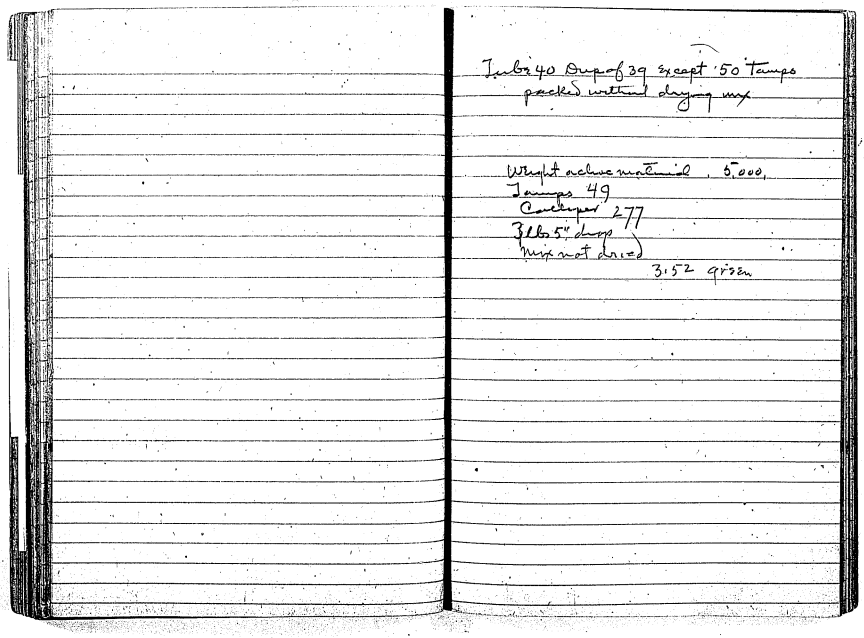
Note, There is more caramel than is necessary 800 mls would be ample & probably 700 would be better, with 1000 it is very sticky & balls up badly more than ½ backed up 1/16 dia & thinning to open is bad—
but even with 1800 Caramel with green thro 80 on 200 there is no trouble with balls & it mixes OK—

Tube 39—
6000 green thro 20 on 150
1,500 flake nCO 72/28
1 000 No 3 Caramel
Tahour 20 Tamps—
Run Reg

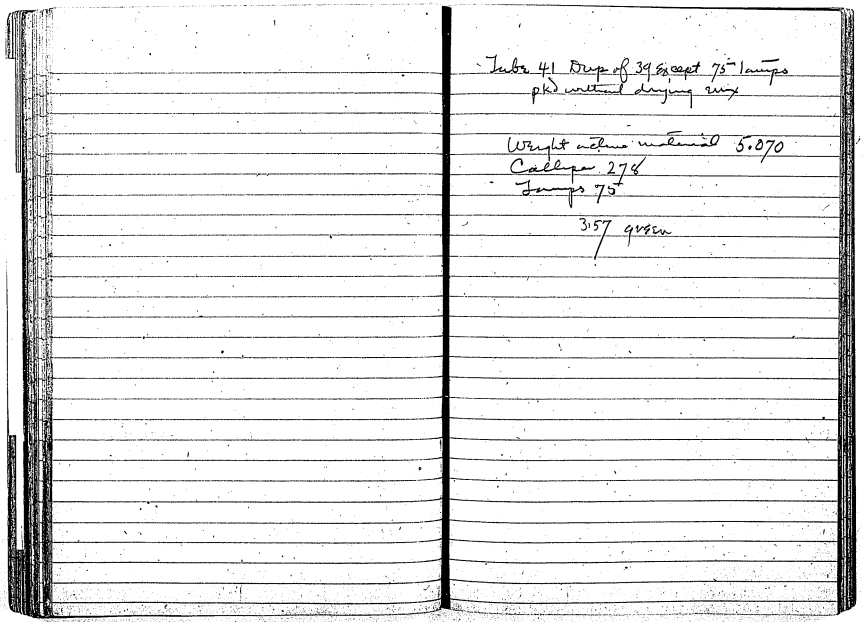
Wt active material 41.150
Calliper .275
Tamps 19—
Reg welded tube completed.
3 lb 5" drop—
packed vertical drying mix

2.92 green

Note.
As far as getting maximum material in the tube, 100 tamps gives 3.62 green
75 " 3.57 "
50 " 3.52
19 " 2.92.
Then not less than 50 tamps is best but tests may show something different—


Tubs 40 Dups of 39 except 50 Tamps packed without drying mix

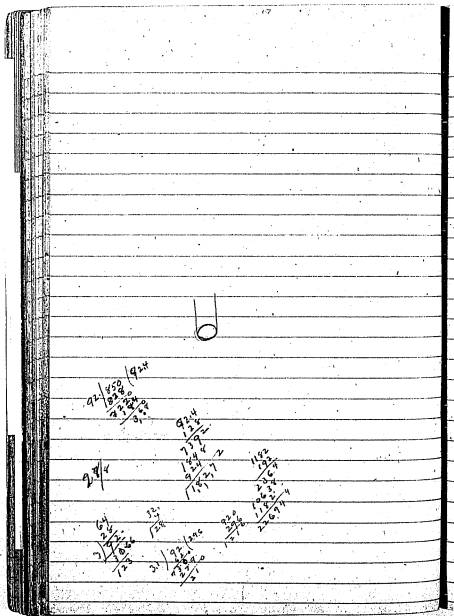
Weight active material 5.000
Tamps 49
Crutchpins 277
3 lbs 5" Dups
Mix not dried
3.152 grams



Tube 41 Drop of 39 except 75 lamps
pkd without drying mix

Weight w/out material 5.070
Caliper .278
Lamps 75

3.157 grams



Tube 42 - Dupef 39 Except 100 Temps
pkd. wetted drying mix

Weight active material 5.140
Temps 97
Caliper .278

3.162 grsm

Tube 43 packed with Convex ball on end plunger - same stuff as in 39 - pkd without drying mix

Wright active material

Caliper

Jumps

Tube 44 - dup of 639 but with Reg Lamps

PKJ watered dumping mix

To be opened out to see shade of mix

Opened up - bad flake disconnected & all very green - in breaking it comes off in sections where fresh lumps are at these points flake reaches clear across apparently GOR - The sides are good but in the body The large particles break up & separate the flakes & the all very green - notice the flakes are sometimes 4 to 6 thick one on the other which is a very poor use of the flake - We are now trying different dyes green also flake to get best results -

Tube No 45 - Same stuff as 39 - But packed with a round Gabe same dia as rod

Weight of live material 4.915
Collapse 27.7
Temps 41 - E
Reg tubs
3.46 grams

We must make a series of tubes with 8 oz 1 lb 2 lb + 3 lbs & now to see if its necessary to pack flake metal as much as graphite.

all previous tubes Thro 20 on 150

Tube #6 — Thro 80 wash on 150 —

6000 green
1500 flake Thro 20 — MCO 70% flake
1000 No 3 Caramel

Works dryer than when Thro 20 on 150. + seems cover ok — under micro dont ball up much if any + as you work it more + more gets shy powder We are going to open it + see how it looks + if favorable will make a Dup + put on test —

Upon opening it it shows very much better than Thro 20 on 150 — There seems now to be continuous metallic conducting system — if test bears out theory This green showed 6Ω Thro 100 on. 200 with 6000 green 1000 No 3 Caramel + 1500 flake — to 47 ohms gave very good results, apparently there is no pores between particles all in mass + its difficult to see where there can be circulation Except some 150 wash and be put in to be dropped out —

Tube 47 Dup of 46 to 6z piston test.

Weight active material 4.820
Caliper 277
Jaws (42 -
Req welded MCo 11/28 tube -

3.14 gram

notes

Tube 48 - thro 100 on 200
This is a little too fine. 1000 No 3 Cascade
Covers ok - thickly but its underneath
to be Early in mixing flake on
before add balls get out by twisting
to too dry - This tube is to be
opened to see how it looks

Probably is that all through
80 mesh since be ok -

Under mecro it dont look well
Covered like a ll previous ones
see lots of green -

On opening sides well shined with
flake + breaking shows good net
work of flake + best yet as far as
that is concerned, although thro 80 on
180 is good.

not corr

49=9 now make a big lot 30 000 green 5000 No 3 Cadmoul + 7500 flake Co Ni 72/28 - 1 hr 20 it forms good sticky mix + easy to make put in flasks (1 hr 20) mixed pretty good some balls but easy break it gets dry after a while, but there wrench probably 6x time for mixing in 5 minute altmas under micro can see lots green but is so well mixed that I think it will be OK there is considerable amount large flake + probably will those the mud green the flake should be reached through 30 or 40 mesh to give better covering although this may not give as good test as having some big flake in VERMICULITE this lot to test tamp weights

Tubs 50 - 5" Drop 1 Tamp
Weight on Tamp 8 oz

Weight active material 3.340
Tamps 39
Calipers 272
Required Tube W.Co plated
2.135 grams

Tubs 51 Drop of 50 - 8 oz

Weight active Material 3.383
Tamps 39
Calipers 270
2.389 grams

Tube 52 5" Drop weight on
Temp. 16 oz

Weight active material 3.900
Caliper 275
Temp 38
Reg Tube
2.75 grsm

Tube 53 Drop of 52 16 oz

Wt active material 3.780
Caliper 274
Temp 39
2.66 grsm

Tube 54 5" Drop Weight on Rod -32 g

Wright Celluc material 4.415
Calliper 277
Tamps 41
Req Tube
3.11 grsm

Tube 55 Dup of 54 32 oz

Wt celluc material. 4500
Calliper 277
Tamps 41
Req Tube
3.17 grsm

Nat Corning 328 5" drop

Tube 56 - to determine amount of
No 3 Caramel -
6000 grain
1500 MgCo 72/28 -
1250 - No 3 Caramel -
Triturate and dry Mix not dried -

Weight active material 4.710
Caliper 277
Temp 38

3.229 grain

Tube 57 Dup of 56 Cut

6000 green
1500 flake NC thru 20
1500 - NO3 Caramel
only little dry at end of mixing

Wt active matter 4.975
Temp 41
Caliper 276
Replicate -

3.31 green

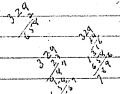
Notice 56 57 & 58 flake breaks up least in 58 more in 57 & broken up finest in 56 —

Tube 58 Dup of 56 — Except

1800. No 3 Coarse.
Very sticky - mixes ok at end dry flows & not dry thumb there is no balls. would be easy —

Wt active Material 5.110
Jumps 41
Catchpan 277
Req Tube —

329 grm —



Put in bottle 2 pm July 5
not cor

Tube 59 Thro 80 mesh fines left in —

6000 Green Works ok — no balls
1500 Flaker McCo thro 20
2000 No 3 Caramel — tried the big lot of very thick Caramel too dry.
3 lb wt 5" Drop -
50 Jamps or as near that as possible,

Wt active material 5.390
Jamps 50
Calliper — 277

3.40 green

pulv 6 Tuesday July 5th 2 pm
not cor

60= Thro 80 mesh + all fines in
·18000 green
4500 Flake Ni Co thro 20
6000 No 3 Caramel. very few balls,
may be lots fine ones but none on 20 mesh
seems to be ok + well covered, good sticky
green —
Make 50 lamps as near as possible
316 wet 5" drop -
Wt. right active material 8.365
Caliper 276
Tamps, 49

3.38 green

61 Dup of 60-

Weight active material 5.415
Calliper 276
Temps 51

3.41 grams

62 Dup of 60

Weight active material 5.405
Calliper 277
Temps. 52

3.41 grams

Put – 6 Lbs per jar 5 · 230 pm

63. Not cor

18000 green thro 80 mesh all times in
4500 flake Ni Co thro 20
4500 No 3 Caramel work Lbs too
Dry on acct of more fines – wants 5400 to 6000
Make 50 Tamps as near as possible
with 3 Lb 5" drop-

Weight active material 5.275
Callipers 276
Tamps. 48

3.51 grm

64 Dup of 63

Wt active material 5.280
Calliper 277
Jumps 48

3.51 grams

65 Dup of 63

Wt active material 5.415
Calliper 277
Jumps. 51

Small crack on one end

3.6 grams

Pwd — battle July 5 3 pm

66 — nat cor
18000 green all thro 80 marshall fine m
4500 NuCo flake thro 20.
6000 No 3 Cariamel —
To have 50 Tamps as near as poss. 6 lbs
and Weight 2½ lbs 5" Drop
Be sure have weight right + Exactly
2½ lbs — Cover good

Wt active material 5.495
Calliper 277
Tamps 53
Reg tube NuCo plated + tube welded

3.46

67 Dupe of 66

Weight active material 5.410
Caliper 277
Temper 51
Req tube. Un Coated - Tube welded

3.141 gross

631 6169

68 - Dup of 66 -

Weight of dime material 5.500
Caliper .277
Lamps 51

3.47 gram

put in bottle July 5 4 pm

69=

18000 green thro 80 mesh with all fines
4500 Flake Ni Co thro 20 mesh
6000 No 3 Caramel

To have 50 Tamps as near as possible
Use TWO POUND weight 5" fall

Wt active material 5.266
Caliper .276
Tamps 51
Reg Ni Co plate) Tube, used) Tube used

3.32 gram

70 Dup of 69~

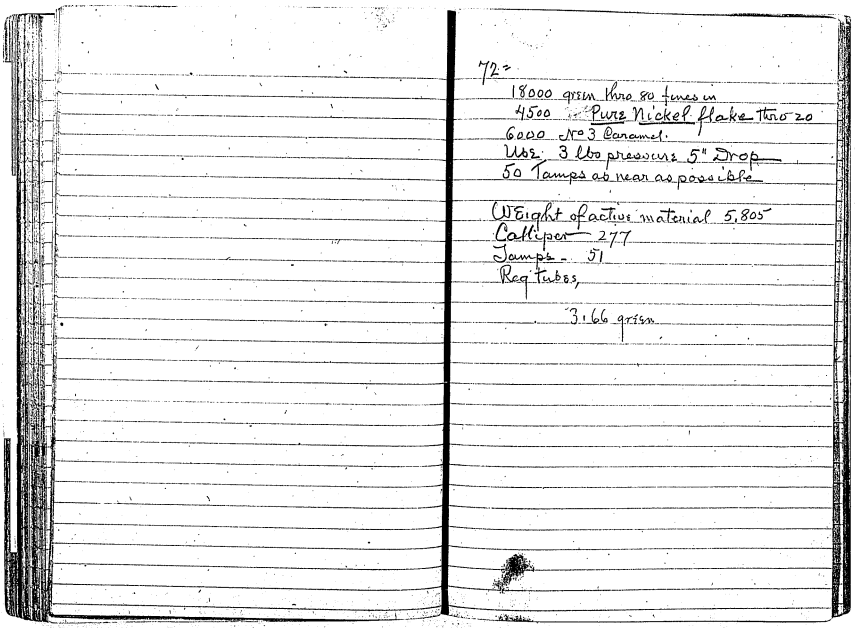
Weight active material 5.240
Caliper 276
Tamps 54

3.30 grem

7.1 Dup of 69-

Weight active material 5.250
Caliper 276
Lamps - 53

3.30 gram



72 -

18000 grain thro 80 tines in
4500 Pure Nickel flake thro 20
6000 No 3 Canamel.
Use 3 lbs pressure 5" Drop
50 Tamps as near as possible

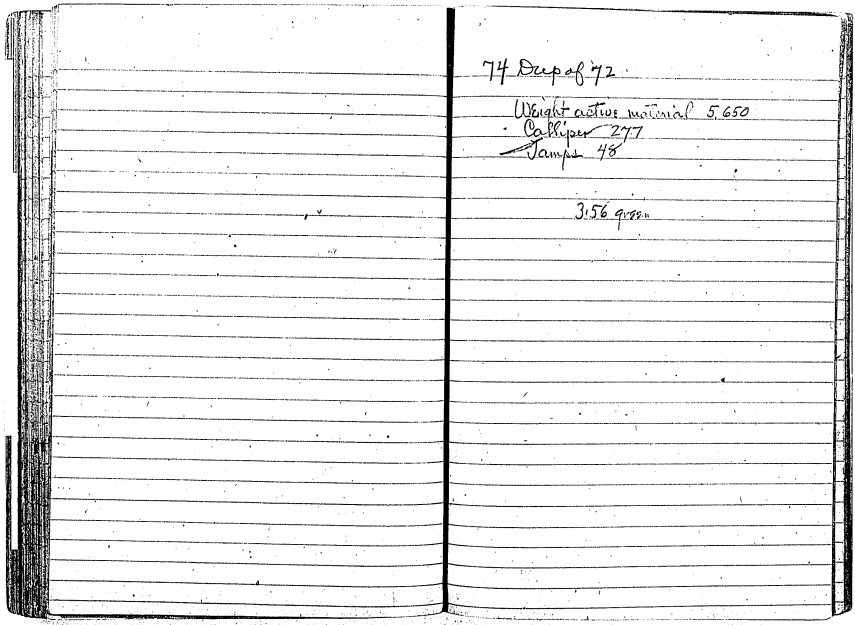
Weight of active material 5,805
Caliper 277
Tamps - 51
Reg Tubes,

3.66 grain

73 Dup of 72-

Weight active material, 5.770
Caliper 277
Tamps, 51

3.64 grsm



74 Dup of 72

Weight active material 5.650

Caliper 277

Tamps 48

3:56 gross

75 Tubes -
19000 green Thro 80 with all the fines
4500 Flinke M. Co 72/28 Thro 20
8000 No 3 Caramel wks OK -
50 Tamps
3 lb wt 5" drop - Rg tube.

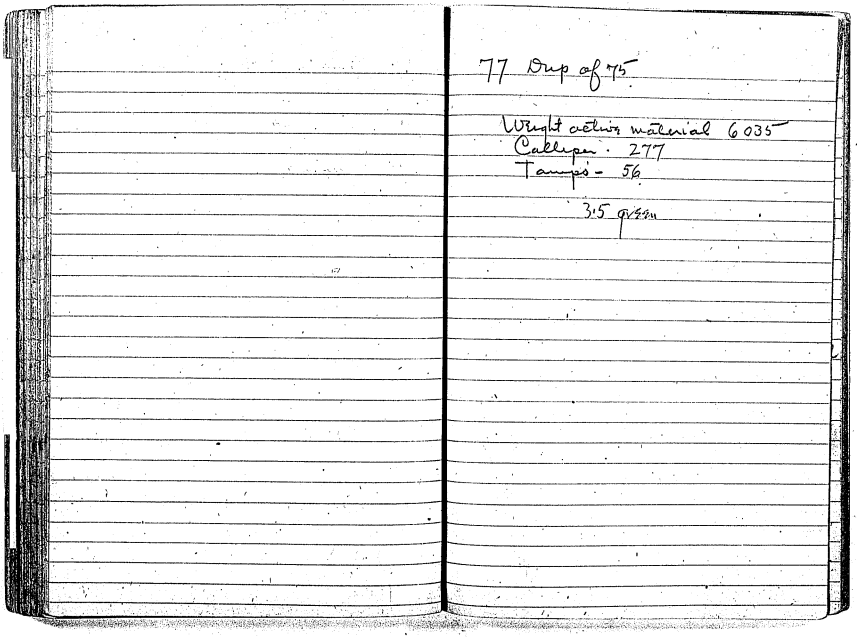
Wright active material 6 068
Calleyn 277
Tamps. 53

3.58

76 Dup of 75

Weight active material, 5.990
Caliper 277
Tamps 56
small crack on one end

3.48


77 Dup of 75

Wright active material 6035
Caliper - 277
Tamps - 56

3.5 gr/cm

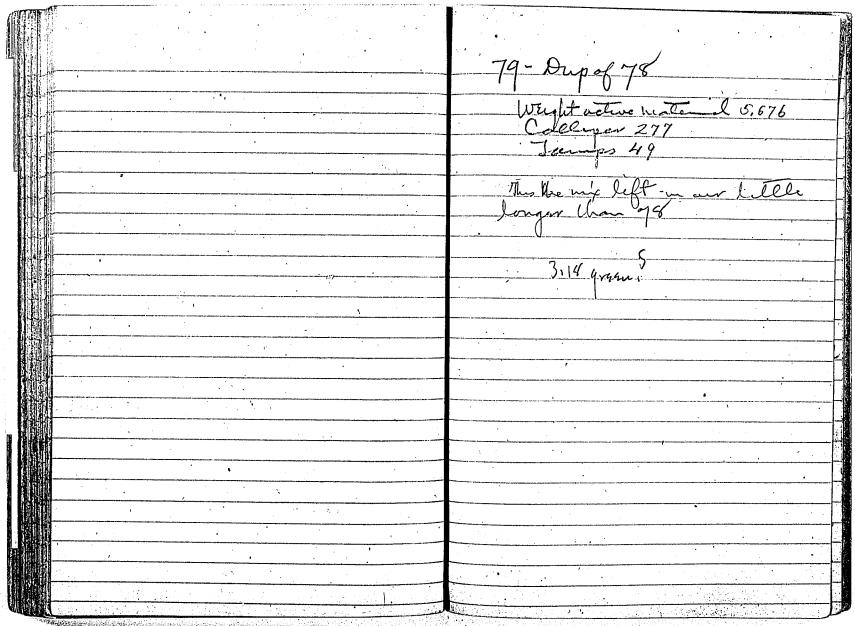
78=

19000 green Thro 80 all fines in
4500 Mx Caflake at 1st Stick to screen
1500 " mixed in afterwards
8000 of No 2 Caramel. I found
for some unknown reason 6000
Caramel thinner than No 3 was
too dry + 6000 thicker than No 3
too dry so took 8000 + this OK
but it was not very sticky like
usual but flake seemed about
perfect (2) 4500 flake + Sauce flake
didnt break up like it does
when more sticky + there was no
trouble with balls. -
Use 50 lamps. 3lb 5" drop -

Weight as issue material 6.670
Cackpes 277
Jamps, 55

Small crack in one end.

3:69 passed

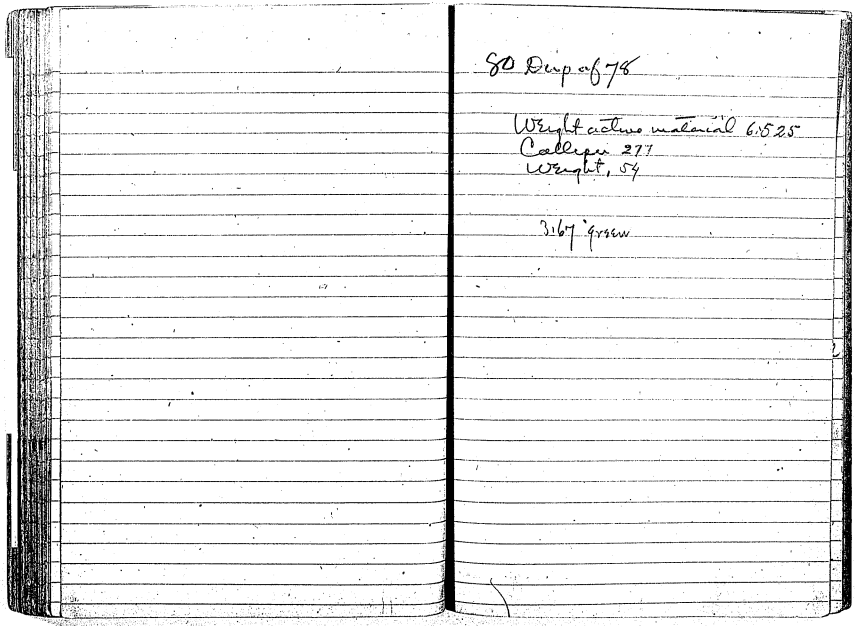


79- Dup of 78

Weight active material 5.676
Coulombs 277
Seconds 49

Thus there might left in our bottle longer than 78

3.14 grams


80 Dup of 78

Weight active material 6.525
Caliper 277
Weight, 54

3167 grsw

81 –

18000 lbs 80 fruin in –
6000 M Co flake lbs 20
8000 glucose

The glucose was too thin mixed it with green it was a perfect gut had no sticky properties
I mixed 10 min and it – Dried it for 20 minutes
When mix got more sticky – then put in flake – notice in micro that the particles are all separated + stick to flake at points, but are not covered all over like when you make sticky condition
also notice flake not broken up as is usual with very sticky mix –
Think this will be OK if particles green don't come off flake + aggregate
The glucose should be made so it is slightly sticky at first then in set working it gets to right consistency
If it works I think by assembly not to have mush so sticky that it balls or break flake up + yet hold particles to flake –
If glucose Chuber made it work to cover + has no particles in it like Caramel

of Course a large quantity water
Evap from the 8000 so it will be
hard to calculate the gross
Used 50 Tamps 3 LB 5" dump
Reg Tubes –
Weight active material 6.550
Cadleys 277
Tamps 54
Small crack in one cord

3.67 grams

There is a greenish cast to mix
because particles not covered
all over but it looks fairly
well – it would be practical –
if it would work but its doubtful
of working. Glucose evidently is
not as sticky as Molasses for
some bulk but it goes on the
nickel, but thinks it has all
the sticky properties as it
works in OK from which would
show that it should go in
to any great extent,

very sticky stuck to the end of plunger

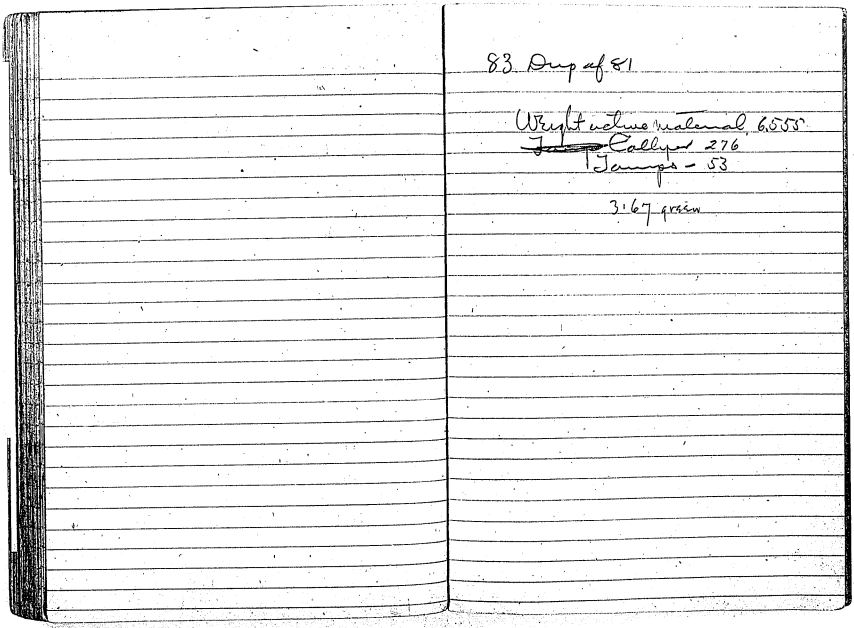
82 Dup of 81

Wt active Material 6.415

Caliper 277

Jumps 5Y

3.160 grams


83. Dup of 81

Wright inclusion material, 6.555

~~Test~~ Caliper 276

Jumps - 53

3.167 grain

84

18000 green Imo 80 fines in -
6000 flake McCo 70/30 Imo 20
6000 Glucose regular stuff which will just pour in a thick rope out of bottle to. Then added about ½ bulk of water & heated it slightly & stirred till water mixed when cold its about like honey - rather ropy - it mixes ok but no sticky properties had to spread onto dryer in doing so got it a little sticky but some of the particles exposed simply dried completely hence when put flake in these would not stick flake & constantly screened to bottom Judy will have to look out in filling but guess it will go okay of grease our way
50 lamps - 3lb 5" drop

Weight a Mcleans 6.175
Cadeyn 2.76
Tramps 49

3.164 grain

85 = Dup of 84

Weight actual M. 6.228
Calcium 276
Tamps 48

3173 gtsm

86 Dep of 84

Wright acommodations 6/85
Calkyn 275
Lamps — 48

3.71 yrs

87

18000

6000 NaCo flake 70/30 thru 20

8000 glucose same as used in 84

Not sticky didnt want to dump it much, mixed ok but has green cast in micro each particle separate but only mixed with flake not Covered the sticky particle causing three 9-degree spring-

50 Temps 3 lb 5" Drop

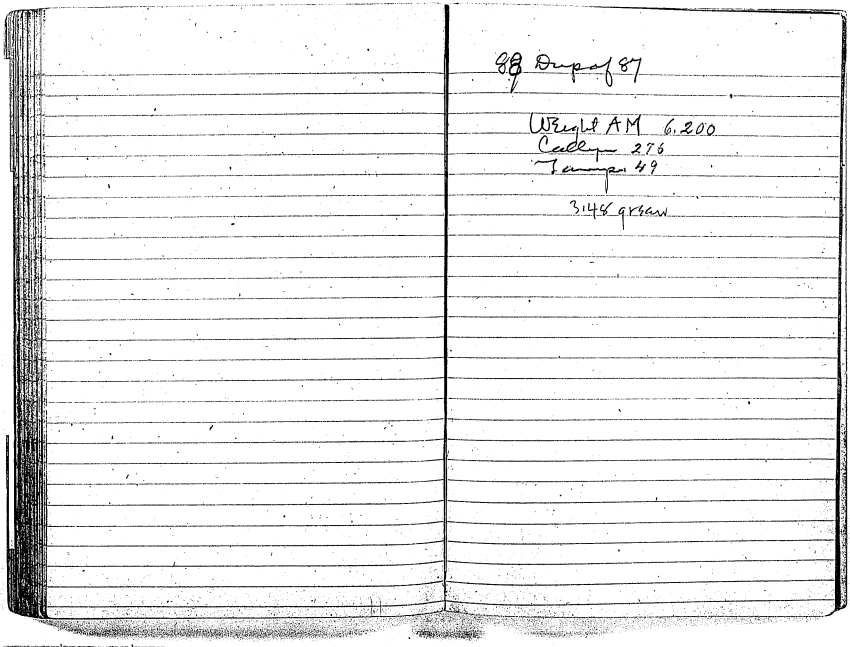
Weight AM - 6.590

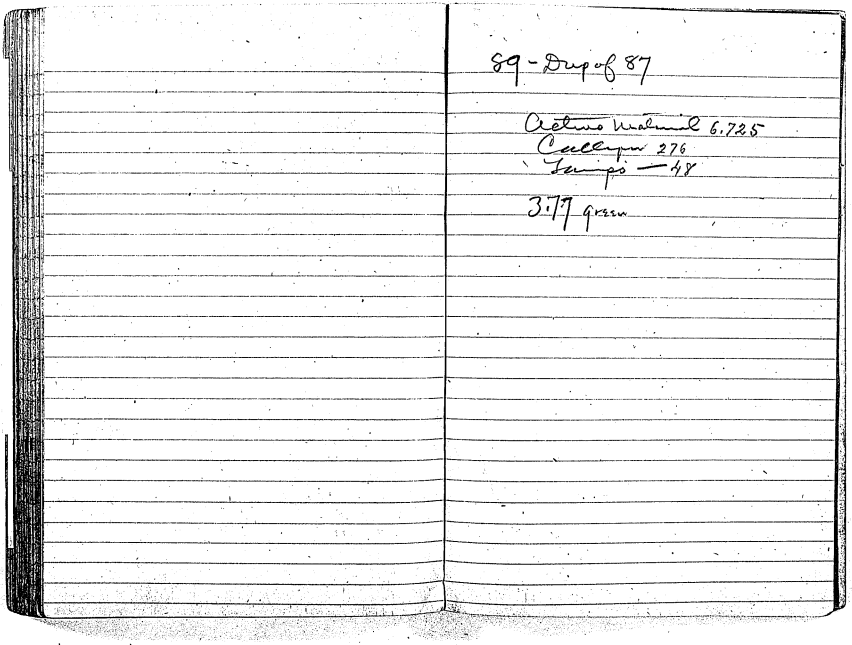
Caliper 277

Temps 48

To dam sticky had to clean plunger every 4 temps

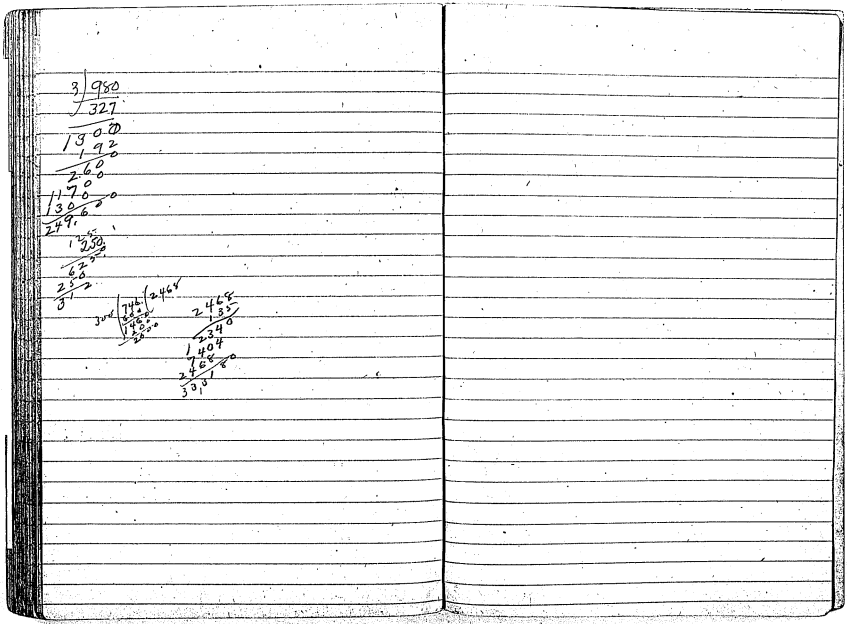
3.60 grain

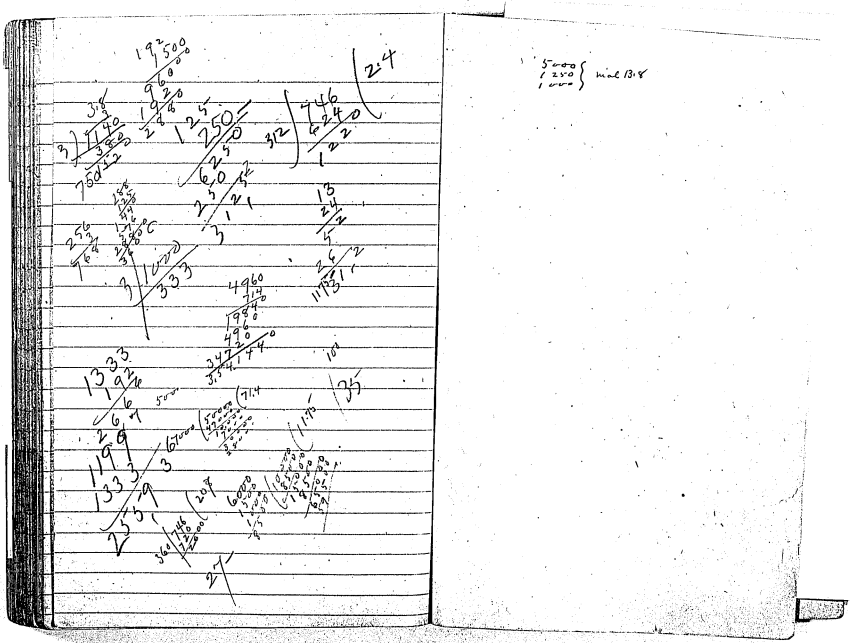

88 Dupont 87
Wright AM 6.200
Cadiz 276
Tampa 49
3148 green

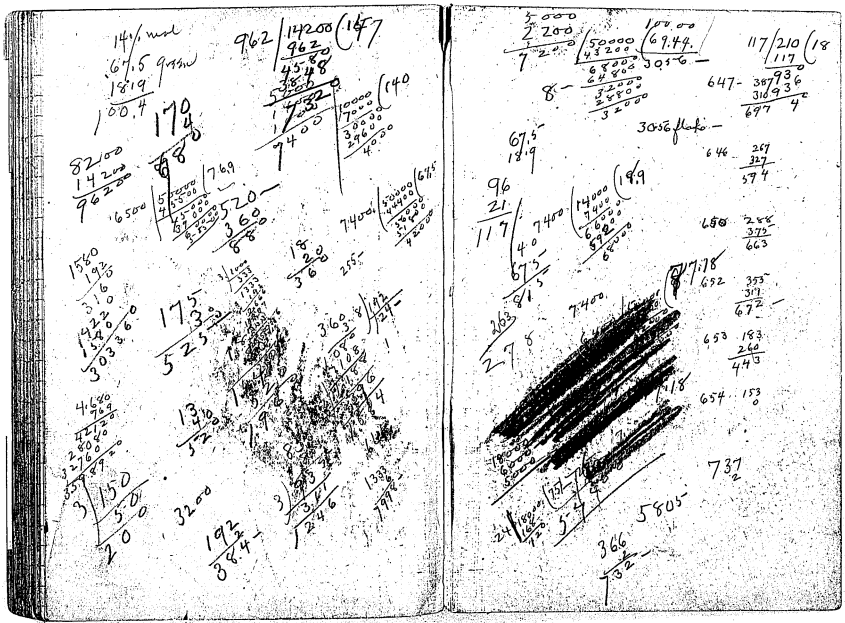

89 - Dup of 87

Octano Molecular 6.725
Cuscapa 276
Tiempo — 48

3.17 grams







Notebook, N-05-07-20

This notebook covers the period July-August 1905. There is also one dated entry from January 1906. All entries are by Edison. The book contains notes regarding the search for sources of cobalt, which Edison tested as a component of his alkaline storage battery. Included are survey notes of numerous North American mines, along with records of cobalt ore separation experiments. Near the end of the book is a list of battery experiments to be performed. The front cover is labeled "Cobalt." The pages are unnumbered. Approximately 90 pages have been used.

Cobalt Ores —

North American Lead Co Columbus Ohio Works Fredericktown Missouri make a bye product concentrate about so much of 10 to 15 tons daily claim to have immense deposit — Cone assays according to the Cos letter of July 20 1905

Lead	4.57%
Copper	8.48
Nickel	3.10
Cobalt	3.59

The 25 lbs sample sent assayed according to McCrath.

1.87 Cobalt
1.74 Nickel —

571 Mullet Very Very Strong Cobalt reaction
(Litchfield) Co Conn near Litchfield
Sample from J T Hubbard see Letter July 11/05
It appears to be phyrotite - Mass. —

570 Mullet - from York Co Pa Carroll Twp
Bell mine - sample from pile ready
for shipment
Magnetic full of pyrites Very Very Strong
Cobalt reaction

25 Barrels Auriferous pyrites, Chapman
mine NC. VV Strong Co or its
Prospected for Montague mine. N.S. or Nova Scotia

24 Barrels Auriferous Pyrites, Henderson
mine NC., or its same as 25
Montague - its impervious - VV Strong

566 Miller - Very Very Very Shining Co -
from York Co - Carroll Township
Logan mine - surface ore at top of shaft
formation by Bass Morris
Magnetite - full of pyrites
This is Longpecker mine & worked -

546 - Lehigh Co Pa Mill Very Very shining
1 Mile from Alberta Mary Sands farm
ore bank - ore from pits
It's a poor lean Ironstone, you it - ?

533 Miller. Very Very Strong Co -
Blair Co Pa Blair furnace East
Alloona Baker Mine. ore from dumps
of 2 pits - Limonite ore - iridescent,

532 with Blair Co Pa Blair furnace of
East Allroona Baker mine:
Ore from No 1 Pit, Lean Limonite -
Very Very strong Co

498 Miller - Cumberland Co Pa
Dickerson top ore bank - Sides of bank
Very Very strong Co. Reg Limonite,

518 York Co (Miller) Franklin Township
Heck's Mine ore ready for shipment.
Limonite Very Strong -

514 Miller - Cumberland Co Pa
S Middleton Tp. Ege bank (Reed - ore Co)
ore from bank - Very Very Strong
dense Limonite - -

513 Miller Cumberland Co Pa
Middleton Tp - Pepper banks
from two pit sides + waste dump
Limonite - Very Very strong Cd

511 Miller – Cumberland Co
Middleton Township J. L. Musser
land. Iron pits [illegible] side of
Ravine? – Very Very Strong Co –
Limonite –

503 Miller Cumberland Co.
S. Middleton Township. Lukens & Yocum
bank sample furnished by Yocum &
said to have come from property
Very Strong Co – Dense limonite.
Think may be magnetic by it.

502 Miller – Cumberland Co Pa
S Middleton Township –
Lukens 4th Seam bank –
On Dump ready to Ship –
Very Very strong – Lumpite.

493 – Miller – Cumberland Co Pa
Dickenson Township –
Laurel No 2 Bank – Side of pit.
Lumpite – Very strong –

492 Miller – Cumberland Co Pa
Dickenson Township –
Laurel No 1 bank. Dump at
Washer average of mine –
Lumpite – Very Very strong Co

485 Muller - Cumberland Co Pa.
Southampton Township
No 1 — Ls Phila & Reading Coal & Iron Co
Sides - Limonite Very Very Strong Co.

482 Muller - Franklin Co Pa
Southampton Township
Mine or Mineral Bank Dump
Very Strong - Limonite -

457 Muller Franklin Co Pa
Peters Township
Aquaine Stinger Bank Dump from
old workings Very Very strong Co
Limonite -

467 Mills - Franklin Co Pa
Guilford Township
Lime Kiln Bank
Dump - Limonite, Very Strong

438 Mills - Lisbon Township
N Hampshire - Rail Gelena
Sunset Hill house & Franconia Iron
Dump at shaft on farm of
Wm Woods of Boston.
Very strong Co -
Quartz & pyrites well Concentrate
5 or more to one - pan it -
Ground & cut well ploy go 8 to 1

419 Miller Bath Township - N Hampton
Forsythe Mine: Main Cut & Tunnel
Walls & dump -
Quartz, slate, pyrites, some Copper
will Conc 6 to 8 to 1 — pan —
Penn Stone Co —

This worked to 2.7 tons per ton left in 100 tons Conc

Sample sent to McGrath marked No1 is concentrate from Longreaches Logan Mine near Dillsburg Country

Metallic Iron	60.500
* Sulphur	1.318
Phosphorus	0.010.

The tailings slightly roasted just enough to darken them + black. were all pyritic, gangue panned out and Marked No 2

gave Metallic Cobalt 1.31%

Reed 2 66lb of Longreaches Dillsburg ore 1 66lb shipping ore. The other 66lb gangue with some ore in -

On crushing the gangue found that if crushed to 1/4 cube a rich concentrate can be made 50% — The gangue + Conc from the 1/4 was crushed to 50 mesh - The Conc would

work nicely on the Belt Seperator

The amount of ore in tails could not be got out very well on account of dust & small clinging particles. The 1/4 Tails would not assay over 100% Iron on panning there is scarcely a trace of Pyrites — Whereas The Concentrate after working to raise the assay have some Tails & there shows considerable Pyrites — This proves that the Pyrites is practically all in the Iron & that the whole product of the mine should be crushed to 1/4 inch & rough Concentrated then dried & crushed to & thru 50 or 60 mesh & Concentrated on Belt Machine — The tailings Could on Wilfrey Etc -

Took 10 lbs of Longreeker shipping ore Dried it & Crushed to 50 mesh Then Took some & Concentrated with hand magnet to a fair

Conc such as belt may would
Contain abt pbly better —
9 look 5lb 6½ oz
Tailings 12½ oz or 14 3/5 %
of ganghue & pyrites.
Fetter panned it pretty clean
+ made good Conc on little glass + dried it The pyrites weighed 3 oz - 9 fwd by slightly roasting that is magnetic + on working this showed ~~Office~~ how little of Tails as there cannot be more than 2 oz or 2½% of the shipping ore is pyrites —
Thus if the general assay makes the Magnetic proportion a failure —

I slightly roasted the pyrites + made a separation by magnet, the Co is both were the same there being no separation

86
3
2 5/8

Read today from Albertus sample
looking Hake Wood - from
Herbert Reinert. - nothing in it

McCreath Assays

Nos 1 & 2 are concentrate & Tails from Logan-Longnecker mine near Dillsburg - Slightly roasted the pyrites Tails -

The Mag Conc was worked on hand magnet with as good as the Galt machine Could pan-by make it to Co assayed for 7z P & S

The Tails or pyrites are to Co assayed for Cobalt only

No 3 is Bradley ore, Salt Lake City The mine Containing 7000 tons not conc or touched McCreath 6.10% Co 0.16% Ni

No 4 is Bradley Containing 3000 tons - not Conc or Touched - (6.12 Co - 0.18 Ni -)

Nos 3 & 5 sent Aug 4th 95 - Registered mail

No 5 is the 25 lb box of Conc from the North American Lead Co Fredericktown Mo to be assayed for Nickel & Cobalt

NiC assay 1.87% Co
1.79% Ni

No 6 - Ludwig Mine Wash - near albert - from Mr Henninger - 25 lb box - for McCrosth assay for Cobalt

.090 Cobalt

Penna – Notes on Cobalt –

Bedford & Fulton Coo. p 263
Union Township Under Sideriings Hill – float Hematite & Manganese ore

Delaware Co Darby Township
Small deposits of Wad occur with Limonite segregations in the decomposed hornblende gneiss on Darby road in the Borough of Darby

Chester Co In Londonderry Township
Near White Horse Hotel.
Chloritic Mica Schists with Manganese in layers

Blair Co Pa Sinking Valley
on lands of Wm Galbraith. in Mayberry
part of Valley Pink Sandstone
Contains 94 Silica 3% Al2O3 Fe 0.170 CaO Oxide
Enormous deposit of this sandstone
Very fine grain -

Baker Mine Blair Co 3 miles NE
Altoona - The clay - NE part of
mine is manganeferous. - McCamey
for the General run of ore 0.102 CaOx

Damourite. Slate outcrops at
Hensingerville near Allentown Lehigh Co
along St. Thomas Breinigs mine etc
between Patrician Salisbury Conq - Chr
Magnesium limestone sometimes
interbedded in the limestone all the iron
ores port, bowl, pipe clay occur in the
decomposed slate. The cornerstone)
Top only Contains the ore when mixed
with the Potter clay they stop
very little iron in slate.

Ludwigs new mine. 2nd range of mines near Albertus has a vein of Black Oxide of Manganese 6 to 8" thick. Limestone occurs above the ore.

Later Hewington sends sample says 16" thick Coban — 1.33 Co Galt 5.9 and 1 Complete Wellsmith

Lancaster Co Pa Martic Township J & B Simpsons farm 6 Etc near his house & public road a Magnetic Limonite found also a manganiferous Variety containing pyrolusite found in shallow pits in the Magnetic ore hills.

Drumore Township Lancaster Co Ore opening in J W Johnsons place about 1 mile SW of Buck Post Office on Mr Lamboms place 2/3 mile E of Muddy Run Pyrolusite occurs along with Iron ore.

Berks Co Pa on Corbers of Lancaster Co — Jones mine on lands of the Warwick Reserve 2 miles SE of Joanna furnace & about 1½ miles East of Morgantown & 1/2 M S of the narrow belt of Limestone which persues into Berks Co is Explorations for ore which are on the same strike as the Morgantown ore pits near to the Jones mine which has an Excavation Covering 4 or 5 acres Large masses Chloritic Slate with pyrite & Calcopyrites Crop out on sides The Quartz Slate is PINK & full of pyrite & Calcopyrites a Trap Dyke is here.

Delaware Co Pa Bethel Township

Good specimens of WAD have been obtained at the garnet mine of Herman Behr & Co located near Greens Creek W of Chelsea

NY Geological Survey part IV
page 121 under Wad

Wad found rather abundantly
in a narrow range in Columbia Co, it
deposited in a marsh & only in the vicinity
of a range of slate impregnated with Quartz
Veins which contain Brown spar.
When the spar is decomp Manganese
remains & frequently retains original
shapes The gangue contains decomp loses
the spar & broken Pebbles, The Brown
spar of the range Contains an
unusually large amount of
Manganese
Wad found on Mr Gotts farm in Austerlitz
found in a marsh bed lying to depth
16 ft horizontal decay of extends
as far known - The bed is reported 12
to 20 feet wide,
A Bed is said to be found 1 mile
South of the above on the farm of
Judson Park
Wad is found 2 miles East of
Green River at the outlet of a Marsh
Near an Excavation made for Schuyler Ore

many similar localities of wad are reported to exist in this vicinity & in the North East part of Ancramdale

3/4 of a mile South of Canaan Center on David Parsons farm at outlet of a small swamp. Wad deposit has a depth of 6 to 8 inches. The swamp has an area of 3 to 4 acres & is probably underlaid with Wad.

Wad is found on farm of Joseph Goodsell in Hillsdale another deposit is 1/2 mile east of Mr Goodsells.

Oxide of Mn is said to be found near Ancram lead mine Columbia Co. & on the Island of Mt — in pebbles these boulders & pebbles are scattered over every township in the Valley of the Hudson to Long Island Sound they seem to have been derived from Columbia Co & the Continuation of Massachusetts rock into Mass — Conn & Vermont & they contain the

Pulverent earthy oxide of Manganese
that has remained in the Cavities
of slaty gravel where the brown
spar has been decomposed.
The Wad has been deposited in
low grounds & the outlet of
Swamps.
Chalybeate Hill Dale is the Center
of Wad

Gooseberry hill 3/4 mile
East of Delhi in Delaware Co Ulfork
Sept IV NY Survey p 314 -
is a seam of slaty grit 8 inches
thick containing Earthy black Ox Mang
Zn S & black Cu S. It is called
the Coal mine -
There is a stratum about 15" thick
in which mang ite is disposed
the stratum is Co extensive with
the schistose formation passing thro
Grams Watts Sullivan & Delaware
Coos NY its absence at Franklin
Delhi Roxbury Windham,
Durham Montricello Etc.

at Canaan Center ~~[illegible]~~
Tavern (sec pt IV 432 NLY Geol Survey)
1/4 to 1/2 mile south of Canaan Center
in Cut of Railroad is beautiful
section of slate rock of purple and
grey color Quartz Seams run this
rock in every direction. No Quartz
Caiman Brownspar or Hornblende
is decomposed Earthy Manganese
remains. The occurrence of this
Mineral in some quantity in
the rocks of this region accounts
for the abundance of Wad found
in this region.

failed to record counter but the
the largest greenschists we met
on the road - about 7.5 miles -

597 = Miles from Portaferry
in Armoy road, 20 ft in a side road
Black green schisty rock - clear exposure
road - Took samples every 6 inches
Samples uneven. some three times the wt
of others. In some bed of rock
are brown streaks from 1/8 to 1½ inches wide
somewhat decomposed & lighter than
green rock - Think the brown rock
formed 60 to 50% of the Total
Preliminary test no Co

598 This is the brown schist
described in 597 =
Prelim test no Co

599 1000 ft further along from 598
road - about 20 ft wide - part black +
part reddish Earth - left hand road
some Co + Ni

600 - 950 ft from 598 along main road
on right hand road - Quartz showing
Boring apparatus

604 - float,
Gray slate dry ashy green wx
about 1 ½ sqr inches four Cobalt,

604 Dk ac black slate - Walnut size
weak Cobalt,

604 Very green spicc, hickory nut. no colors

604 Purple Very little Co — weak -

604 - Quarly Walnut size — very very weak

601 - is same location as 599 - This
is quarly slate shrink ghly 10 ft or more
wide - Canton brown fresh wx -
Some little Cobalt some Ni I think.

602 - about 1100 ft further East on
main road left hand side in front
of unoccupied house - 12 ft across -
dull slate outcrop — 8.23 miles for Poughkeepsie
on America road

603 is on same strike 10 ft further East
from 602 - runs right into road all in
front of the unoccupied house -
Auto Counter shows 8.23 miles
from Poughkeepsie - on America road
Beyond pleasant Valley -

604 - float in different Colors found
at 603 -

605 about 1000 ft further from
603 - a 8.60 miles from Poughkeepsie
on auto Counter - This bay reformed
is between 2 Red barns 800 ft apart

605 Continued –

Ledge upward to ed 6 turn SW – about 3 ft wide included in this sample is a green slate rock sample twenty five ft NE crumbly into road

606 – is 25 ft NE from 605 15 ft wide ~~included of a specimen of green slate~~ ~~about 2 ft wide crumbly into road~~

607 further on 15 ft Red slate about 6 ft wide – the shale is closely diffoliated but its Color –

608 next to 607 is 10 ft of pale green thick shin slate –

609 – 9.2 miles from Pomfret by auto Country in front of a gate with 2 stone pillars – 10 ft of green –

610 Next to 609 · 8 ft wide mixed Red + green –

611- float at 610—

612 a little further on 9.33 mile for Poughkeepsie Courthouse going up hill - quite an outcrop as if blasted for road - This sample is 12 ft wide green & Red. left to dread -

Probably get Nice [illegible] magenta Co on Red - most strong to last finished quite strong [illegible]

[illegible] 3 quite strong [illegible]

613. Same place on right side road Sample 25 ft wide - Hillsboro find the Red slate very hard & quite sharp from the green

Thin in places 3 ft thick in 1st strip - the green strong & hard otherwise [illegible] magenta - white spots in the red also also Co but not nearly so strong - apparently no partition in the green -

Note so far we have found very little slate ~~[illegible]~~ stringed with Quartz - The float in fences show lots of Cavernous Quartz [redacted]

614- near top of hill right hand side over the ditch is a ledge of Quartz mixed with slate which has black slate in it which shows by the open which Wyeth speaks of.

10.1 miles by Court from Poughkeepsie very fine brown stone quarry

614 Continued - we almost have got samples not weathered but did not have proper tools —

"Note its 11.4 miles to Washington Hollow Hotel by our Auto's Courtesy from Poughkeepsie —

615 – at Millbrook: where sidewalk blasted out of ledge of rock - sample all way Cross about 100 ft – dip 75° clay thin bedded, has quartz seams at spots about 5 to 8% quartz seams - dont seem have any brown spar in quartz Color rock generally black to Brown scarcely any decomposed — 15.7 miles from Poughkeepsie – State house Co – of Quartz. some little Cobalt,

616 – Cavernous Quartz in fences, broken some large pieces at picked out lots showing blended brown spots.
22.1 Miles by Courtesy from Poughkeepsie

~~Trees make a clip for wheels~~
34" tires - on front axle wheels does
the Country
618 is Cobalt Blue Clay
Tuesday

619 - From a fence about a mile West
from State Line Village. left hand side
Mixed green slate & Quartz with
Brown & green intermixing -
Which there is considerable Nickel - Cobalt is
rather strong in slate - Quartz very faint Co + Ni -

620 about 1½ miles beyond Common Corners
~~State Line Corners~~ 17 miles
of section from Pittsfield - Saw a slate
mine up on a hill on the right hand side
general sample, owned by Howe,
Who lives near mine PO address
E Chatham - - No houses in Common Corners

622 A same place as bridget
Sample of block earth, man at house
said they called it muck or
block Earth. The cliff appears C
to be nothing but Vegetable muck
many acres there are several acres

of it all along Valley, thinning down
50 ft or not quite to bottom,

621 – At Canaan Center found
old RR. & place on road where
you go under RR don't [illegible]
South along RR to find the
Rock cut Opdyke of the Geological
Survey Can't find this cut
spoken of but found small one
took samples as above to south
side of place under RR about ½ mile
South –

623 – from a wall at Canaan Center
near the White House & bleak Colored
Barn – The farmers around here don't
seem to remember of there is any green
red slate near here –

624 + 625 - from Cut in RR. on right hand side of the road going west Mountains at Canaan Center + along the Cut in RR now abandoned + spoken of in old geological survey. Its 36 ft wide + 12 ft high - quartz exposure -

626
After leaving Canaan Center went towards North Concord about 1 to 1½ miles + then Turned ~~to Northwesterly 7 mile~~ 900 ft from turn outcrop Conglomerate took samples -

9/11/11

627 - about 1000 ft beyond 626 first green slate outcrop 10 ft -

9/11/11

628 - 1000 ft from where we got plums + took water + turned at angle up the steep hill got to Anticlinal Ledge parallel to road in ditch - green + purple rock and big gash sharp turn - pretty

628 = There is a great deal of Ni in the Green rock here of the blue cup like NiSO4 Sal is due to it — With NiSO4 sal after it was swept to dry + NiSO4 crystals [illegible] only lightened a shade showing a strong nickel for a rock like that if its due to green color not 1/3 was taken out by weed it will have 6 to 8 per cent — The Cobalt is rather weak —

seem the purple is manganese. use mix the green + purple together — the line between green + purple is very sharp — Every acre of beam immense ledge — Hill is very steep. use winches up — Rock — Labatie Dimple here — Very weak Co + Ni in purple — The green very strong blue in NH — Think it is Ni — but yet — Nitric after acid quit green still for 22s

629 — on opposite side road in fed by outcrop Quartz with greenish rock in it —

over the hill from 629 - about 1000 ft [illegible] on the left fork going to Andrebsky's at Hanna — down the [illegible] 6 or 8 acres float, land low near camp 1 ft muck then hard pan —

lots green float float. Quartz float + purple along [illegible] road —

630 is a bag of float 1/4 mile further on on Andrebsky road —

631- 1.8 miles from Auskradaty Bay
Rock Country - outcrop along
road cloth of Quartz - right hand side

634 & 634b - 2.3 miles South of
Auskradaty - float found banks
of stream at Bridge across
the road left hand side -
Specimen for Museum shows stream Cobalt

635 is from ledge of rock
running into the stream on
opposite side creek - There
is a dam here or was - Specimen for shows Cobalt

636 - from same locality of 634 -
bank of sand yellow light wood
like mineral, can't say how
much - No Cobalt

637 - float 3 miles from Auskradaty
on road to Hallsdale after you
make the turn - Boulder weigh
2 or 3 tons also from Bay quality rock
has a little float

638 on a ledge running into road right near 637 - 25 long -

at 635 it's full of Quartz + maybe the stuff I spoke to Pico -

Man digging hole near Hellidale says on Gerke Parkers farm took dirt out of Black stuff also for the pond at Pico House 639 - is sample from there - (to) Pico pond -

Cobalt mine – 35 miles S W of Salmon City Idaho & 110 miles from Red Rock station of Oregon short line in Montana
Address Leon S Griswold
Prof of Geology Missouri School mines
Chemical – Wad 2.11% Ni & 5% – usually Cobalt fine pyrites in Shists
Go to probably where Utah sample came from Carrying 6% Co –

Chemical pyrite from Huasco Chili S 20 | As 43 Co 24 Fe 12

at Lewiston, (Montana) In Madeira Limestone
Cast Fe specilia minute granules in the gray quartzose
Dendrites at Lowell & Elsewhere black oxide Manganese
is Commonly seen in the joints in dolomite & traverses
large quantities — Mt/Geo Surv 144 Part IV

Cobalt occurs in Considerable
quantity in the black Copper ores
of the Spanish province of
Leon —
Cobalt has been found in a few
in Porphyry in Connection with
manganese

Processes for working arsenical Cobalt ores.

No 1

Roast

Dissolve in Nitric — filter

Evap nearly to dry — large quant Arsenious acid seperates

Largely dilute with H_2O — seperate the "

Pass H_2S — throws down Ar Cu + Bi Sulphides Sn also

Filter + boil off H_2S until Ferrous goes to Ferric

While liquid hot precip Co Ni by Bicarb Na in excess as Carbonates + Iron as ferric hydrox.

Wash precip well,

Digest precip in excess aqueous Oxalic acid — ferric oxalate dissolves. Ni + Co oxalate insol.

Modified

Take sol after H_2S passed. boil + precip the Fe by adding Co or Ni hydroxides, the Fe precips + Ni or Co goes into solution

Or take the solution + add a little Carb Soda + boil — the ferric gradually precipitates.

Langlois Process

No 2 Process

Unroasted ore dis in Nitric
Evap sol to dry
Dissolve in H_2O
Add Carb Soda with constant agitation till Co + other metals precip, this indicated by red color of precip
The precip is Arseniate of Fe
Filter.
Add hot Solution of Oxalate Potash - the whole of the Co is precipted in a few hours as Oxalate.
If precip contains Arseniate Co it can be removed by Nitric Acid in which Co Oxalate is insoluable
The Iron-Arsenic + most of the Nickel remains undissolved.

No 3 Process

Roast ore
Dissolve in Nitric
Filter + dilute with proper quantity H_2O
Saturate with Hydrosulphuric acid
Filter again.
Boil.
Use just enough Carb Potash to precip Iron
Dilute with water.
Add small quantity NH_4Cl - then Potash
Boil Ligniod until it no longer gives precip with KOH.
The Red Cobalt solution is then filtered off + yields
Deoxygenated Cobalt on Evaporation.

S

No 4 Process.

Roast ore

Add in successive portions 1 pt ore to 3 pts Bisulphate Iron

Heated to Melting point in Enamel or iron crucible

It becomes pasty

Heat strongly till it fuses quietly + stops giving off fumes of Sulphuric A or sour excess acid given off

Pour out it Solidifies.

Break up + decolde in H2O boiling

Filter from Arsenate of Ferric + Copper ox $ which not Sol in neutral liquids

Pass H2S - filter - Boil - to drive off H2S.

Precip by Comb Potash

If no iron in ore add Sulphate Iron to roasted ore This prevents forming Arsenite Co. as it Combines with Fe in preference Lobiqs

No 5 Process

1 part powdered ore fused in Covered crucible with 3 pts Carb Soda + 3 pts Sulphur at a gentle heat so Co S dont fuse but remains in form of a powder – [3] it fuses its hard to wash
Repeatedly exhausted with H20 to removed Sulphurets Na
Treat again with Carb Soda + Sulphur + Exhaust with water –
Dissolve in Nitric or Sulphuric + precip by Carb Soda –

No 6 Process.

Powdered 8oz 1 part
deflagrate with 3 pts Nitre
Exhaust with Water
What is left dis in Nitric a hot. a small part of Ferric ox remains undissolved -
Precip the Copper by Iron
Supersaturate the Liquid with Carb Ammon
Filter from the Iron precip -
Concentrate by Evaporation when Considerable Pa will seperate out,
Filter.
Evaporate to dryness -

This seems ok-

107 Process — Uxbridge factory

Powders ore -
Fuse with Chalk + fluorspar
Slag thrown away
Grind fused product very fine. roast in reverberatory furnace 12 hours till arsenic fumes all gone.
Dissolve in HCl
Dilute with H_2O Mix with Hypochlorite Lime to Convert iron to ferric
Then precipitate with Milk of Lime to throw down Fe + Arsenic.
Wash precipitate + throw it away
Pass H_2S through solem liquid till filtered sample gives black precip with Ammonia
The Sulphides due to H_2S washed + thrown away except those are Bi Cu Etc in them.
The final Sol is treated with Bleaching Lime. (Hypochlorite ignite) to throw down Co + afterwards with Milk Lime to throw down Nickel -

Notes

To seperate Ni from Co roughly Crystalize the Sulphates of K & Co + Sulphates of K & Ni. The Double sulphate of K & Ni being less sol seperate out first - Several recrystallizations will make almost perfect sep

Prolo chloride Co with free HCl + Chloride Ni Pass Chlorine to solution thus removes the Co to higher stage + has no effect on Ni Solution should be largely diluted with H_2O

Add Carb Baryta to excess stand 12 to 16 hours with frequent agitation. The $BaO + CO_2$ O_3 Collected & filtered Wash well with cold water dissolve in HCl hot, remove the Ba by Sulphuric a

Filtered Solution Contains Ni + Ba remove Ba by Sulphuric - Then precipitate Co + Ni by KOH,

No 8 Process

Patera's Process for Chromium Cobalt & Nickel Ores

Ore roasted in presence of Potassium –

The Roasted with Common Salt,

The Chloride of Silver formed is dissolved by a solution of Hyposulphate Soda

& precipitated by Polysulphide of Soda

The remaining Solution is used for

Extraction of Cobalt & Nickel –

Notes Separation Co from Ni

Acidulate a chloride soln with HCl + add a hot solution of Nitroso-β-Naphthol in 50% acetic acid till the whole of the Cobalt precipitd Precip washed Cold then hot 12% HCl & finally in hot water.

Separation Co from Ni.
In ores — the Co & Ni are precipd as sulphides in acetic acid solution — great care taken to eliminate manganese which would interfere with correct estimation of Co Sulphides are ignited - dissolved in Aqua Regia Salt mixed with Ammonium Phosphate 5 times Wt of Mix Co — with 5 pts HCl for every part of ammonium salt. Mix boiled Vessel removed from flame — while hot NH3 added in small quantities at a time until precip 1st formed — this solution stirred vigorously when fine purple Crystalline precip which is Ammonium Cobaltic phosphate see further Clarke. Chem News 48 262 263

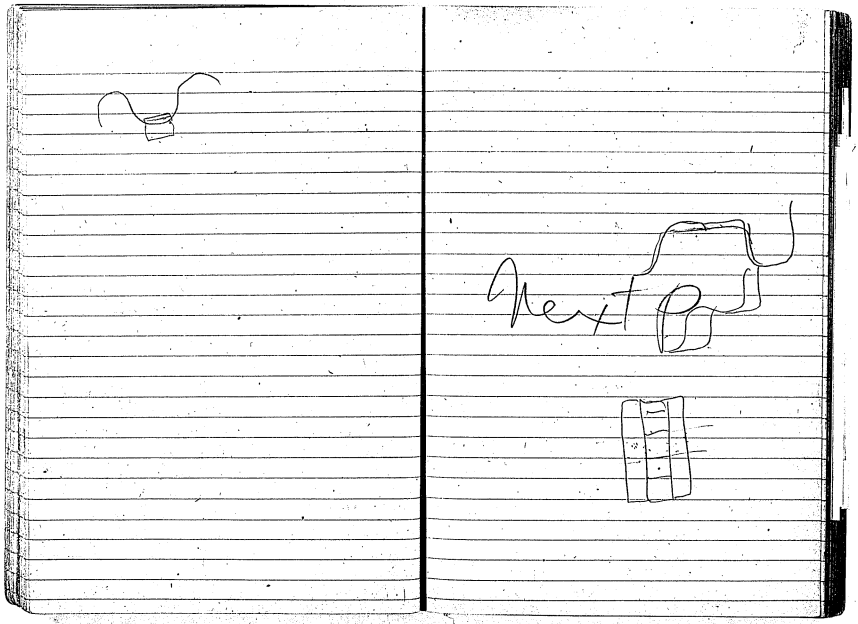
Extraction Cobalt from Manganese ores
Herrenschmidt Dingler's Polyt. J. 252 - 392

Cobalt ore treated with Ferrous Sulphate and Enough water to form a paste the reaction is said to result on the Oxides of Cobalt & Mn on boiling the mix: a solution of Cobalt & Manganous Sulphate is obtained which is seperated from residue & treated with suitable agent so as to convert the proto into the per salt

Seperation of Iron from Co & Ni -
Solution with very little free acid mixed with MHy Sulphite. in quant sufficient to form a double ~~salt~~ Sulphate with Co & Ni present sol diluted to 150 cc mixed with large Excess Oxalic a precipitate formed precipitate by adding more MHy Sulphite Clear liquid mixed with MHy slight Excess heated 1 gently for few mins filtered & washed with H2O Containing MHy Clear liquid drawn off & Ni salt Co Electrolyzed Boiled?

Extraction of Mn + Co from their ores
Manhès Dingler's P.J. 254 271
Prepares & separates gangue of O of Arsenic
ores of Mn Co - by fusion + Blowing air thro
in Bessemer Convts until almost all
Fe Elementical + reduces Contains
15 to 20% Metalloids Mn Co removed by
usual means.

Seperation Mn from Co
Mix of the 2 oxides or Sulphides free from all
other Metals, dis in Aqua Regia
Containing much HCl - Largely diluted
+ saturated with NH4 Permanganate of
Potash added till permanent Rose
Color + then Chlorine with Manganese
precip by ROH,
The Co & Ni is precip from the mixed
filtrates & washings acidified by
Acetic acid by Sulphuretted Hydrogen
The mix of Mn + Mn oxides dis in
HCl NH4 added in Excess liquid
Exposed to air Ni may then be
precip by HS. May be used in large
scale to very accurate.
Delvaux Compt R 92 723.


Next Page

Seperation of Ni from Co -

Ni & Co seperated in usual way from other metals are then precip by slight excess Ammon sulfide - bulk of liquid removed by adding H_2O then dilute Sat KCy added Cautiously to avoid Excess. The Ni sulfide being Completely & readily soluble very dilute KCy & Co sulphide being practically insol Its Easy to see progression of reaction by the clearing of the liquid in which Co, sulfide dots of floats. The liquid & ppt and + Co S collected + seperated in usual way. The filtrate containing the NiCy is slightly acidulated with H Cl of $\frac{1}{4}$ Sp. when by the NiCy thrown down Thrice washed & ignited to NiO,

To seperate Qualatively Ni + Co

Precip by dilute KOH - Collect ppt heat with Conc KOH, sol of Co ppt deep Blue - filter Three times.

Detection of Ni + Co

NiO remains unaltered when heated with KOH + Iodine - CoOhide CoO is oxidized to Co_2O_3 hence if precipitated oxides of Ni Co dissolved in Nitric + water precipitated by KOH. precipitated with Iodine + the oxides be then extracted with NH_4 + Am Chl only the nickel will go into solution + may be recognized in it by Triammonium Sulfide -

Separation of Ni + Co

Reducing agents act more vigorously on $Ni(OH)_2$ than on $Co(OH)_2$ Hence KCl readily dissolves $Ni(OH)_2$ but is without action on $Co(OH)_2$

For large quantities Co the Ni may be separated as follows - precipitated by KOH + Bromine - to precipitate add few cc KCl 10 cc - shake well + add tartaric Evaporate with Aqua Regia + in presence of Ni gives less the reactions of the metal when the Ni is in great excess some of the Co goes into solution

Seperation Ni-Co Vortman
Monatsh. Chem 4 1-9 (1883) Wallace.
Cobalt Sol mixed with NH4Cl + treated with Na Hypochlorite complete Oxidation takes place & boil a few mins sol deep red-brown-yellow - Contains Co as Lutteo-CoCl(NH3)5 Cl2 on diluting with H2O after Cooling + adding small amount KOH. Liquid Contains nothing but Co + will remain clear but if Ni in it it will be deposited in a short time as hydroxide. + very small amt Co can be detected + Ni as Vernon Ni -

A blue ammoniacal Sol Ni containing very small amount Co usually exhibits after treatment in cold with Na H2PO2 a distinct red-violet Color but even if the quantity of Co present is too small to produce this effect. Boiling after dilution with water + addition of KOH + Solution from precip Ni(OH)2 will exhibit faint yellow Color if quantity not sufficient to show this its presence can be detected by adding NH4 Sulfide which gives black precip.

002

If the quantity of Co is enough to give a strong red color the Co Ammonium Compound will be decomposed on boiling depositing Co_2O_3 Do not use too much NH_4 in 1st solution otherwise excessive amounts KOH will be necessary to form the precipt

Deposition of Co

Conc Sol of Rochelle Salts added to Cobalt Sol until precip 1st formed is redissolved from this Solution the metal is readily deposited,

Titration of Co

Manganous Cobaltous salts can be titrated with K Manganate. a measured val of feebly alkaline Sol of K Manganate of known strength is taken & the Mn or Co Sol added until sol is decolored. The precip should quickly with Manganous the precip is an oxide of Mn & in case of Co is Cobaltous Manganate $CoMnO_3$

~~Cobalt~~

Cobalt Fe & Mn Oxides fused with Borax - Co is the primo-pal one to dissolve -

Seperation Ni Co & Fe

Precip all 3 by ammonium Sulphide treat with dilute HCl - Soluble will be reach in Fe with out little Co Ni

Precip the Fe as basic acetate - perfect sepn of the Fe from the Ni Co is effected more perfectly than by the "Basic Acetate" treatment alone

Seperation Zinc Ni Co -

Convert all into formates with neut. Excess formic acid - precip by H S

900

precip Mercuric Chloride Ni + Co by Cold 6 hrs. Suspend precip in 1120 pass chlorine Whole of Nickel will be in filtrate as $NiCl_2$ free from Cobalt

Sepn Co from Ni

Palmer Solution of the 2 oxides boiled with H_2O_2 which oxdzs the Co + not the Ni after cooling KF added then HCl + Solution is titrated with Na Thiosulphate — Note solution not dirty the Co_2O_3 out by NH4 OH it will - the Ni O not appreciably dol

Cobalt ppld from Ni by H_2S.

Saturate Sulphates of the 2 metals at 0 Centigrade with H_2S: then heat to 100 Cent. Ni Sulphide ppd Co sulphate not decomp ppd however Contains some Co even when the amount of free acid is almost sufficient to prevent ppd of Ni

H Hamburgey Compt R 106 - 132 135 -

Delffs Method —

Precip Co as sulfide from acetate by passing a sol of Nitrate or Sulphate with a amount of Na acetate not quite sufficient to convert all the Co into acetate — but enough. Insoluble precipitate of Ni is precipd at same time

Alumina may be seperated from Fe Ni Co by Cooling the clear sol of the mixed ferro cyanides with Ammonium Chloride —

Same sol as above is boiled ~~then~~ with Ammonium Sulfide. until NH4 Cl does come off Zno sulf is alone is precip therefore this is ready method to septy Zno from Fe Ni Co —

Same sol as above Mn seperated from Fe Ni Co by H2S. Mn is Easily precipd —

Utah Arsenide 14 Shots 7.00 & 3.00 – to the 3.00 lot. Crushed 100 mesh – Panned in Water. Very Careful –
7.850 grams float
1 450 " Common with Considerable pyrites –
920 " Pure pyrites –
by Crushing 85% thro 200 mesh & getting up a real Concentrate Could do 4 to 1 with Considerable loss in Tails.

Guess best way would be ore to mine Crush to 2" & pick out best ore Crush to 100 mesh roughly Cone & Shup. Saving the poor 2" ore & Tailings from Concts.
If there is Gypsum there Roast with Charcoal Mixed Lump & put into a Sulphide –
There is too much loss in Concts – 2 to 1 is the limit of saving and to get Kept below 1% + that's going to be different ~~Pan~~ Cone should be roasted with Charcoal perhaps –

145=0
4 20
2 7

Note: Letters the following the pages are taken from Dana's Mineralogy 6th Edition 1951-01-04

Cobalt at Chatham Co
Inactite 1.35 to 3.82 Co
12.19 to 9.44 Ni
Occurs in Mica slate

Skutterudite As Co Co 20%
occurs in Hornblendegranulyne in
Gneiss in Norway

Cobaltite from 9 to 33% Co
S+As - Occurs in Mica
slate in Sweeden

Gersdorfite: fm 0.26 to 14% Co
S+As occurs in Blende +
galenite at Phoenixville Pa

Cobaliferous Mag. nickel
San Baldomero mines at Mt Sorata
Bolivia - also at Inquisivi
bet La Paz + Yungo Bolivia
3 to 5% Co

Sypapoorite
S Co 6.4% Co
from Sypapoor near Rajpootanah India
occurs in Shists with pyrrhotite

Carrollite
Palapsco Mine near Finksburg
Carroll Co Maryland 37% Co
4.5 Ni its sulfide

Linnaeite 43% Co found in
Chlorite slate at Mine La Motte
& at Mineral Hill Maryland
with Calcopy B Covelle Bornite
& pyrite.

Grunauite
S 38 Bi 14 Ni 40 to 22%
Fe 5 Co 11% Cu 11. Pb 7 to 4%
found in Quartz & Calcopyrite

Utah manganese
Roast in air then charcoal, separate magnetically -

Glaucodot
As 43 S 20 Co 24% Fe 12
Occurs in Chlorite slate with Cobaltite in Provence of Huasco Chile

Alloclasite
S 16 As 32 Bi 30 Fe 5 Zn 2 Co 25%
Hungary

Large deposits Wad at Martinsburg
Lewis Co Nepuk in Swamp
ditto at Blue Hill Bay, Dover, and other places in Maine -

Cobaltiferous Wad found near
Silver Bluff South Carolina
24% Oxide Cobalt 76% Mn

Enargite
As 48 Co 33% Ni 9% Fe 3%
Earthy Cobalt sometimes in brilliant
Cubes.

Hydrous Subasic Arsenical Ni + Co
Desert of Atacama in veins in
decomposed Diorite As 14 Ni 20 Co 9

Cobaltite As 42 Ni 5 20 Co 4% Mg 10
in Sierra Cabrera Spain in gangue of
Brown spar which is connected
with limestone & argil schists is result
of alteration of carbonates Ni + Co

Kathigite
As 37 Zn 30 Co 7% Ni 2
Occurs both crystallized in Germany

Paleraite
Molybdate Cobalt found in
Uranium ore in Joachimsthal -

Dolomite Cobaltiferous Co 7%
Reddish Color Pyrieum -%

"

Remingtonite
Rose colored incrustation occurs
as coating in vein of serpentine which
traverse hornblende & Epidote at
Copper mine near Finksburg Maryland

Cossalite
Co 2 to 4% - with Cobaltite
in Silver mine at Cosala Province of
Sinola Mexico -

Sphenider Co 1½ to 2% Co in
Serpentine

Forbes Phil Mag IV XXXV 178
Nickel is only common in
Pyrrhotite which Cobalt common
to most Pyrites. Look it up.

Glaucopyrite
As 67 Sb 3.5 Fe 21 Co 4.6%
Cu 1.4
found in mines of Quadalcanal
Andalusia Spain

Rabdionite - Black oils
Sweden Fe 45 Mn 23 Al 2 Cu 14
Co 5% Urals

Rhagite
Bi 73 As 14 Co 1.47% Saxony

Roselite,
As 50 Co 13% Ca 21 Mg 4 H_2O 10
Saxony

Opathiopyrite,
As 61 Sz Co 15% Ca 4 Fe 16
Hessen Germany

Winklerite
As 11 Cu 13 Co 39% Ni 2½ Fe 2
Ca 5 Si 2.5 H_2O 14
Thunk Comes from Le compan Co bloom
found at Pitta near Motril Spain.

Macfarlanite
As 21 Sb 3 Ag 59 Co 4 to 7%
Ni 2 Fe 3 Zn 2
Silver Point Lake S

Smaltine in Colorado

Amer. Jnl Science [3] XXIII 350

Stanley Mining Co

Gunnison Co Colorado –

Vein of Cobalt bearing minerals smaltine – predominating gangue promises.

Indications of Commercial ore

Much Calcite in vein in which small[illegible] & Erythrite distributed. No Silica. No Ni. Smaltine Contains 11.5 to 15% Co

The Gem & other mines near Silver Cliff Colorado Contain a number of Platiniferous minerals & small amounts of Co –

Working Wad – Engl. Pat 4486 –

Ind. Chem. Industry p. 235 1882

Wad fine ground intimately mixed 80 pts ore with 100 pts Bisulfate soda anhydrous & adds of finely & Sulphur & air to convert sulfate into Bisulphate

Dry then fuse in furnace

H_2O & SO_4 driven off

then lime, Mag or Baryta (fine powder added) to remove Cu (Ag Au) Mixes finely heated then broken up & cooled & percolated with hot water – to clean solution

add Sodium Sulphide sufficient to precipt Co Ni + small amount of Manganese — filter — Concentrate to save Ni sulfide by Crystallization. Make liquid Evap dry + mixed with Charcoal + heated in muffle furnace to obtain Sulphide Manganese

For process of working Cobalt ores Commercially see Bertram Blount + Bloxams book Chemistry for Engineers p 195 196 197 — Way say for Co ores as ore roasted + mixed with Ferric Chloride Then Ferrous chl - Bruquelle + Calcine Chlorinate the CoO to $CoCl_2$ Fe O $CoCl_2$ Leached out —

C E Mutchanor
New Philadelphia Ohio
(See Letters) Arsenical Cobalt
Nickel Very strong Ni & Co -
Showed say Ni 5 to 7% & Cobalt
2 To 3% + Hewes McCreath
assay for Ni & Co
There is Cobalt Bloom all over
the weathered sample -

A variety of Chlorite occurs with Chromite in Serpentine of Green Valley in American River Cañon California pale purple Color Cr_2O_3 11% NiO .49 Si 32% MgO 35% FeO 1.23%

Pyrosmalite from Cimora Mine Augusta Co Virginia — NiO .275 CoO .269 -

To detect Cobalt in large quant Ni — precipitate all with KOH, filter, Zn precipheated with Conc KOH Co due to blue liquid filter thro a vac.

Reichel Zeits, Annal Chem 1888 468-9

Dunite fm Jenks Mine Macon Co NC
RW Raymond Jahr f Min 1888 2 Ref 302
Contains Magnetite Chromite NiO .35
Corundum mine —

Gersdorffite Arsenate Ni Compound found in Crystalyd Limestone Amer Chem J 1 328 found — Benahamin prov of Malaga —

Titaniferous ores containing Ni + Co

Chaffey Mine near Newboro Co of Leeds Canada Ni O .31% Co O.09
Vanadium .35
Pine Lake ore body Lot 35 Con 4 Glamorgan Township Victoria Co Canada Ni O .27 Co O .07
Vanadium .52
Eagle Lake Mine Bedford Township Frontenac Co Canada Ni O .22 Co O.05

4 miles S of Millbridge Hastings Co Canada Ni O .26 Co O .04
Vanadium .29
Township of Horton Renfrew Co just W of Ottawa River Canada Ni O .43
Co O .10 Vanadium .63

New Foundland Ni O + Co O .39
N Shore Lake Superior .27 Ni O

Dike from Lullerworth Victoria Canada. its a diabase free fm Olivine has little Magnetite has .73 Ni + Co -
Dike from Snowden Victoria Co Canada has .51 Ni + Co

Peridotite mother rock of platinum
Weathers to Serpentine.

Copper pyrites of Cornwall ore
bodies Contain 0.34 Cobalt,

Rupfernickel Ni 44.7% found in
Granular limestone at Silver Cliff
Colorado -

Cortera Corundum Mine Madison
Co. N.C - Chlorite has .33% Ni

Wood Mine Castle Rock Delaware Co
Pa Nio .16.

Ni occurs in high granitic Mountains
of Sierra Nevada Mtns near Mono
Lake, Extending from Green Creek
north to Castle Peak to North fork
of Rush Creek South of Mt Lyell.
distance of 25 miles a vein
opened in White Wolf Mountain
5 Miles South of Tioga Pass -
assayed 34% Nickel

Nickelo reported from Vicinity of Carisa Creek Southern Calif near Desert at White River Kern Co -

Prof Newberry analyzed the Cottonwood Canon Churchill Co. near Lovelock Station Ural ? arranged giving only Copper - Newberry galena ? Dried arsenate Ni pencil Roccolite 33.7 Ni 36% As 24% H_2O

Nickel found at Chatham & other places in Penn Chatham Co Cobalt Mines to called Ni Arsenide 20 to 45% found at Real del Castillo Baja Lower Cal Mexico 400 Miles South of San Diego also Copper nickel & Entered Nickel

Co + Ni found in Ludwig + Centers
Copper Mine near Mdeons
Valley Esmeralda Co Nevada
in a black mineral from 4 to 8%
Co ~~and~~ to 1.5% Ni ~~as~~ hydrated
Cu 6 to 13% Si 39% Fe ap 25%

Jany 2nd 1906—

Experiments with Darby ore

Took 50 grms of the roasted ore - dissolved in Cl f filtered & added Chloride K to precip the iron & traces Arsenious to Arsenic acid - Also added some Fe_2Cl_6 - Then by gradually adding KOH & boil between each addition. Threw down white precipitate of iron - filtered this off - then I found on boiling again that by dilution a large quantity of Fe Cl6 came down so its necessary to work with rather dilute solution & finally stopped adding KOH, boiled a test on test tube with ammonia showed very little iron - The Solution was made dilute & the most of the Copper was precipitated By Cl precipitation & finally balance was filtered - it settled poor & filtered horribly bad - However a test of the $CuCl_2$ solution by H_2S showed very little arsenic scarcely a trace - There was some

Black precip ppty Cu + Sb —
This process is all right, 80%
Cu can be got by electrolysis + it
Can be tested so only the exact
amount of neutralizing Soda
KChlorate used for precipg or
Methypo made by Cahypo + Carb Soda
The precip of Sb arsenate
Can be bag filtered roughly +
dried + the Cu in solution
got out by precipitation with
water or Methyl alc which
dis's Cu + M Chlorides —
I also found that 2nd Extraction
of ores gave very little Cu or Hg
hence if time is given + solution
kept very hot + well all dis-
olved by Regma Regia
gradually by evaporating —

~~Cuttalo~~

Standard Consolidated Mine -
6% Cobalt, Grant Co Oregon

Assay	Si	47.81
	S	4 43
	As	17.28
	Al_2O_3	6 12
	CuO	2.88
	CO_2	1.94
	Cobalt	6 34
	Nickel	0.75
	Gold	0.017
	Ag	0.0058

Some Nickel ores obtained from developmental work on mines in Hemlock Floyd Co Virginia also near Webster, Jackson North Carolina

Arsenic Mines US Arsenic Mines Co now work Rewald Post Office Floyd Co Virginia

Wad occurs in Bibb Co near Woodstock Ala - & in iron mines at Stacks Mills Cherokee Co Ala

Georgia - Cartersville also cave Springs Floyd Co Etowah, Extensive deposits manganiferous -

North Carolina Madison Co near Warm Springs Continuous belt of Mn Ox & Wad 8 miles long 1 to 3 miles E of do - Light Blue Manganiferous ore.
At Caldwell Co 5 miles west of Lenoir also Perkins Mine 10 miles W of Lenoir also 10 miles North of Dobson in Surry Co NC also 1/2 mile W of Blue Ridge gap Mitchell Co Veins 2 to 4 ft thick of Earthy Manganese also Nash Co Jackson Co Chatham Co Gaston Lincoln Cumberland Coos - Caraburus Co
There occurs a series of Beds of manganiferous associated with Kings Mt Slate in Gaston Lincoln & Catawba Coos NC which

are superficially changed to Manganese. Outcrop of Coticule by water on old forge on Crowders Creek on W bank of Crowders Mountain

Mn Occurs at Dorn lands near McCormick South Carolina.

Tennessee Hickman Co also Green Co with Iron Ore at intervals at foot of the Extreme point of the Unakas mountains all the way from Virginia to Georgia.

Manganese is found all down the Chilhowee Mountain range Mine operated 6 miles from Elizabethtown Carter Co.

Manganese found in the Triassic sandstone trap dike near Clinton Hunterdon Co NJersey there was a mine opened once for iron but was Mn 47%. Fe2O3 7% 25% Insol

There are enormous deposits
Wad in Nova Scotia.

Arsenical Cobalt found in Kelsey
mine at Compton Los Angeles Co California
occurs rosy red + dark carmine earthy
masses no workdown although
samples good.

Wad found Woodstock Station
Calhoun Co Ala—

Chatham Cobalt mine
Middlesex Co Conn

The Sterling mine in Gunnison
Co Colorado has only Cobalt
is at Gothic,

Jems other mines near Silver Cliff
Colorado Contain Ni minerals +
small amount Co Bi Pb,

Cobalt with Nickelite occurs in
Grant Co New Mexico in Bullards
Peak district Burro Mountain

Cobalt occurs at Ludwig & Carlens Mine (Copper) near Wassons Valley Esmeralda Co Nevada — it is a new mineral black manganese 4 to 8% Cobalt & Nickel —

At Dracut near Lowell & Middlesex Co Massachusetts vein of Nickeliferous pyrrhotite opened by Co. Erected smelter, burned — perhaps the Charlestown Junk dealers Samples from there had considerable Cobalt

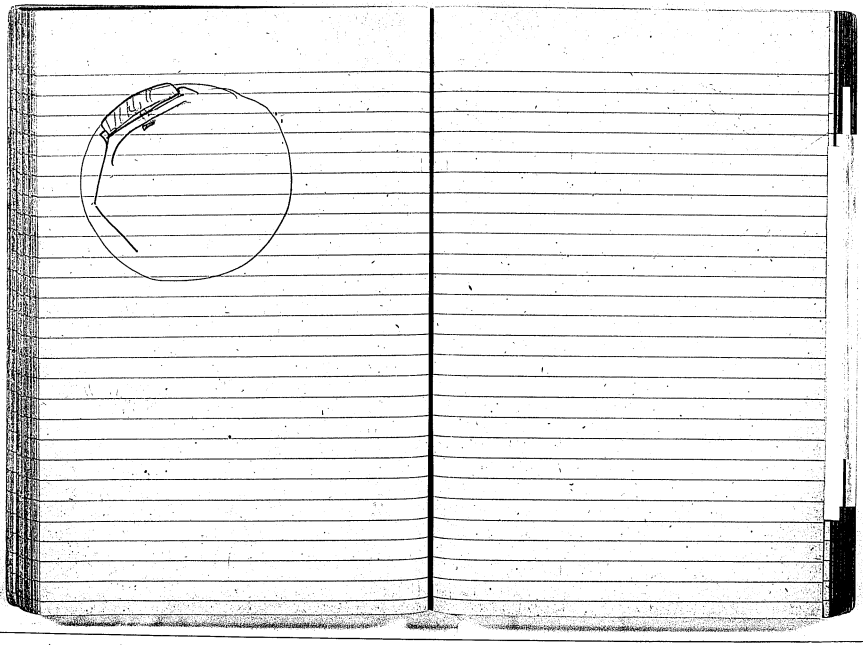
Wad occurs at Bathurst near Rhapsody Mountain at Quaco & Upham & especially the Cattle place near source of Shaunmond River Wad is very abundant,

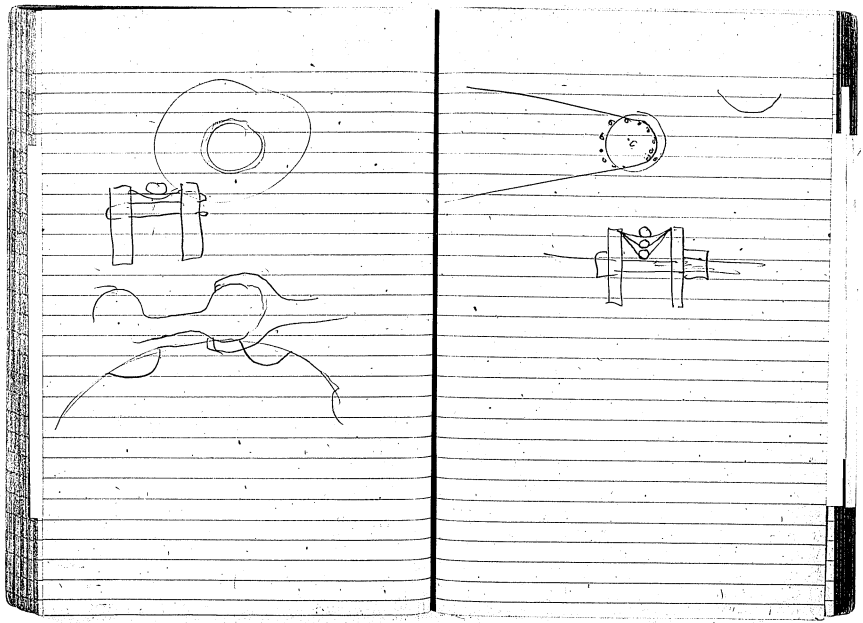
Massachusetts Wad occurs a foot thick covered only few inches soil West of Cole Connecticut River it is seen Everywhere, The primary rock Region especially at

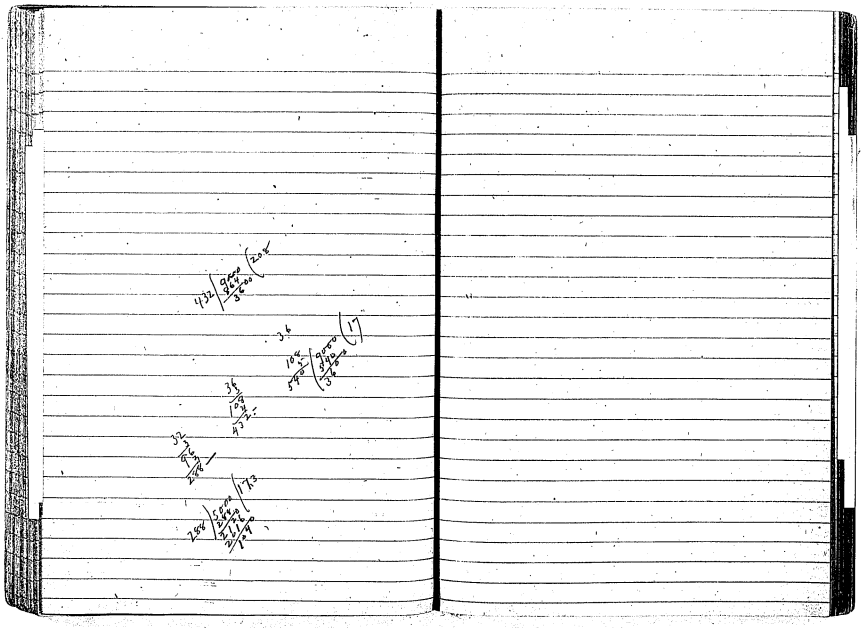
Leverett, Whately & Conway

occurs in low places in Massachusetts — Plainfield in Talcose slate to ~ base of Mangan at Conway vein black Ox Mn 7 feet wide SE part of town Quartz gangue Mn not very abundant but explored think found large quantities. Extensive bed or vein on top of a hill in Hinsdale N Hamp adjacent rocks not visible also 6 or 8 rods E of Center of Village of Winchester N Hampsh Black Ox Mn

Pushaccan roads near Sharon Mfg road Gallant with Cobalt Bloom along from a Charcoal iron furnace in vicinity Bitter investigate the mine







Aug 30 1905 Note on Experiments for 5 Bat

Thro 20 all fumace on flake thro 18 mycs

1 = Dry KOH, mixed with Glucose.

2 Dry flake worked with KOH. KOH & Elc

3 = Take a bad tube from 3 Dups. work free KOH, Dry & fix ends + Corrugate.

4 Same as 3 but only fix ends.

5 Make group with 60 & 40 0004 flake that Woburn made during Cents trip 50 Dmble Tamps - Burn inside -

6 = Same as 5 but burn outside, 50 Dmble tamps.

7 = Same as 5 with Co Salt flake only burn inside - 50 Dmble tamps -

8 = Same as 5 with Co flake & burn outside

9 = Group 60 & 40 0004 mm flake 100 tamps, burn inside - Ends fixed good

10 Same as 9 but burn outside

11 Same as 9 but with Co flake

12 Same as 10 but with Co flake -

13 - 60+40 coke Theoretical 60+40 flake
Dry mix - 50 Double Temps - 90% ends,
burn inside -

14 Same as 13 burn outside.

15 Same as 13 but with Co flake burn inside

16 Same as 15 - Co flake burn outside,

17 - Co flake 50 Double Temps. put Fe
plated Cap on end - burn outside,

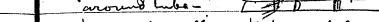
18 - 60+40 - 4 Temps to each section
50 Section -

19 - 60+40. 7 green 3 flake 50 Double Temps
burn inside Ends fixed

20 Co flake 7+3 - 50 double Temps

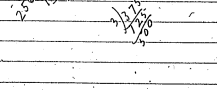
More 30 etc fuses of
Kalling Normal

11= Grommp with button on each end + forced agreement mix - and two bands around tube -



to prevent swelling - to be nickel wire + put on before after filling + twisted tight about 30 wire 6 turns + twisted - burs, points or Cup + may rounded

12 Drop of about - burn inside -



Causes of 1 out of 3 Drops going off—

1st Ends not closed on the mix—

2= Tubes vary in diameter + packing one part loosens on the part

3rd Swells a little in Center loosening Contact at approach of Ends
Trying on a group

4th Bad Contact between flat Ends + the grid after hot test, No

5th Last tube make opts segregate & stuff from jamming — No

6th Bad Irons or some ions give more soluble salts to Rott Cotton goes into tube, drying with — ions on 3rd or 4th Day

7th= strips from which tubes made badly plated or weeded flake off— No

8 Amalgamation + destruction of flake

9 = Some impurity in Iron or Rott. destroying flake or Coating it

10 - In act Tamping tubes could more than drops a deposit from act Hot closes them up element entirely No

11 - Variation in KOH strength No

12 = The burs are of uneven length & when tube is packed it is packed hard where burs strike the holder & loose where the burs do not strike - The tube could be sized by rubbing on a mandrel -

13 = All pumps from 25 to 35 are good on 250 from 100 hot, see other Except a few are bad.

14 = Test the green that's been in 33% for 1½ yrs

15- 9 notice that 123 which was calculated for 72- by mistake- that mistake of giving a Gold tube allowing 2.0- gives 745- & that 72 is the Gold one giving a nickel Cake tube - both had soft Ends - The Nickel Cake tube when mixed taken out showed a bright Center whereas (123 Corrected) that had shown bright Center - possibly Most Cases Ni Flake mix to Contract If flake is fluffy. as there are some good nickel Flakes. melanese No 4. 115

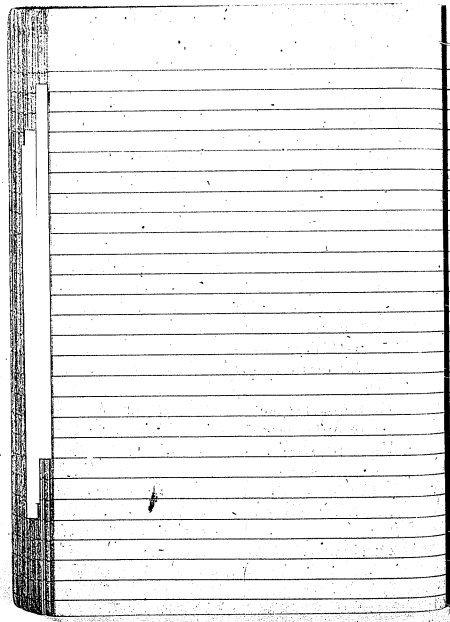
176 174 179 182 185 187 188 189 190
191 192 193 216 218 219 221

Either Covering power was poor - or mix shrunk - or there was some deposit. The tube was fine - good Control at Ends - The Color of the inside of Cube Block whereas Co Ni Cake 123 was Clean Brown - The Ni Cake 72 tube was evidently not charged & Consident be charged it had bright Center - only Explanation is that it was silver plated too light or the mix shrunk. as the Ni tube is yet black & mix shrunk to it - Nico 123 is clean Brown that possibly the Ni flake tube was never plated with Gold alloy -

I put hydrochloric in both solutions of AgCl where I am dissolving the mixes. The Ni flake tube (6N) has green solution the coin 123 is brown — The Ni flake tube dissolves very slow + appears that pellet is very dense whereas 123 is soften + dissolves much more easy also the Ni flake has all gone to powder, whereas Ni 6 123 the flake is still rather large + is several times larger than the Ni flake — it is somewhat fluffy also,
I am going put the tube with Ni flake 72 w/o never plated - on acting on 123 + 72 with HCl - the 72 tube stock looks like nickel whereas 123 looks like Ni

After Eating 123 Ni 6 with acid only got 120 milligrams of flake + have placed 6 6 1.25 - a loss of 90% of the flake in the acid -
What flake that is left seems to be good under microscope —

162 - Tube is of group three 162 477
163 642
164 - 557 -



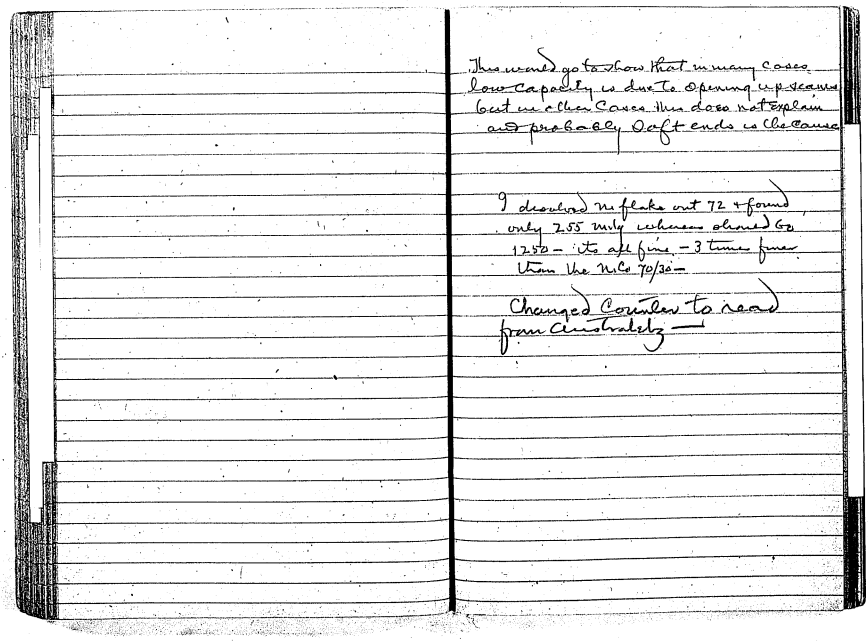
I found 162 - The seam has opened near middle
thus explains its low capacity

146 is of group thus 146 - 592
147 820
148 640

146 has its seam open just like 162 -
Thus explains low capacity
I have sent for 147 to see if its seam has
pulled out Behind. 147 is not pulled
out Thus explains why 147 is so good
148 has seam slightly opened -

I now pick out 4 groups the good ones & bad
ones & have fired tops left out Electrode &
notice the seams -

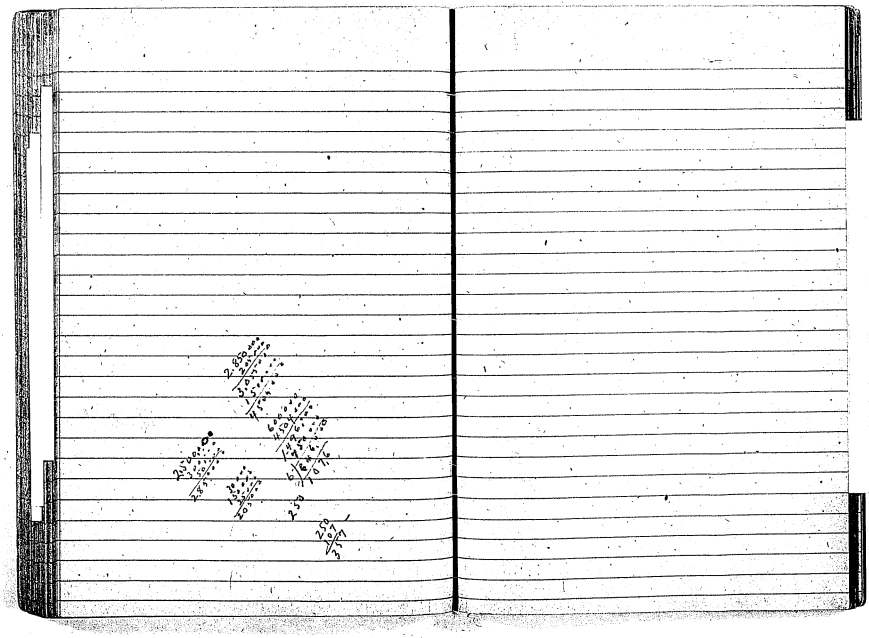
Bad Capacity			Good Capacity		
68	OK	592	63	OK	935
75	OK	640	65	OK	965
92	OK	685	76	"	826
96	OK	650	93	"	922
99	OK	630	85	"	918
93	open slightly	707	89	"	947
105	OK	592	93	"	917
115	open slightly	630	117	"	903
119	open slightly	617	135	"	937
127	OK	697	140	Wife	893
143	OK	662	141	OK	916
146	open (a)	592	147	OK	820
148	open Littlepod	640	173	OK	900
173	opened quite full	615			

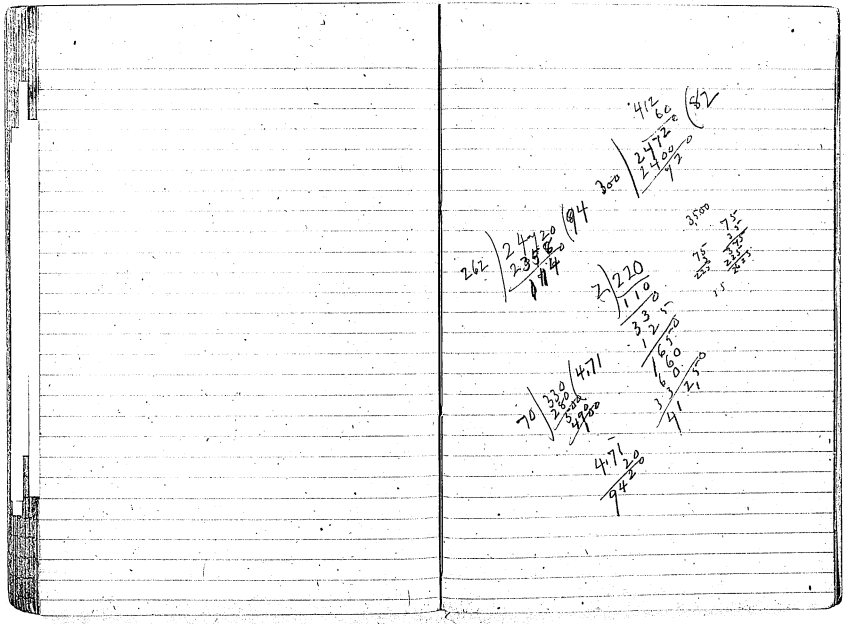


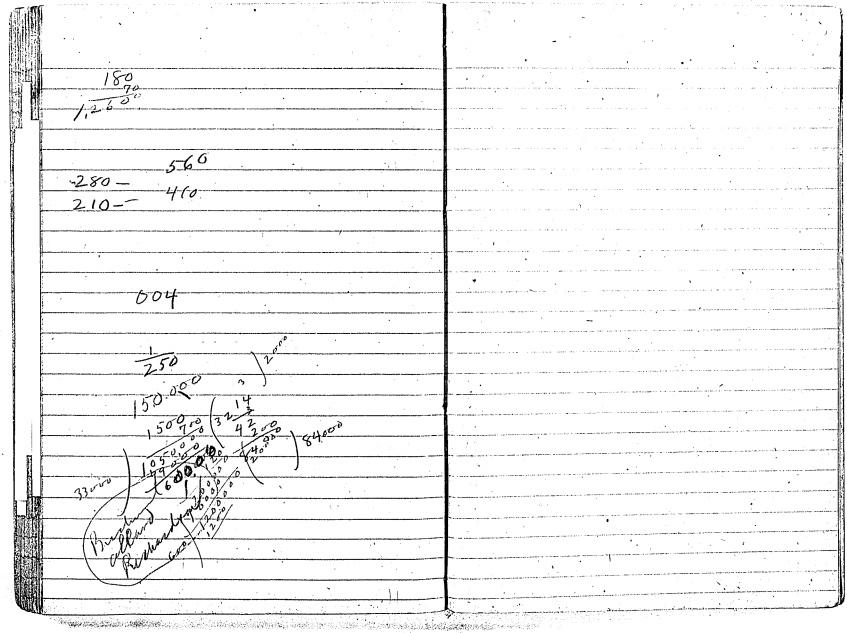
This would go to show that in many cases low capacity is due to opening up seams best in other cases this does not explain and probably Oxft ends is the cause

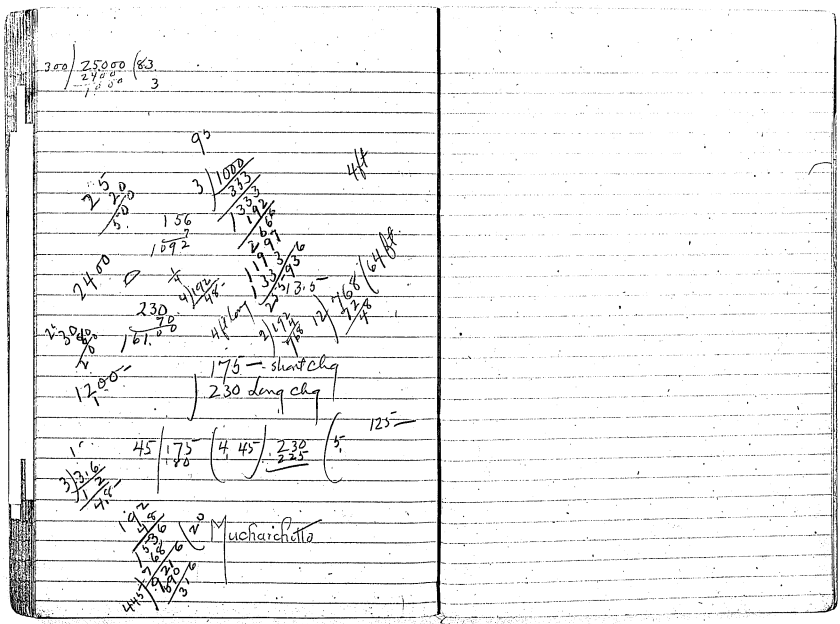
9 dissolved 76 flakes out 72 + found only 7.55 mily whereas obtained Co 1750 – its a fine – 3 times finer than the MCo 70/30 –

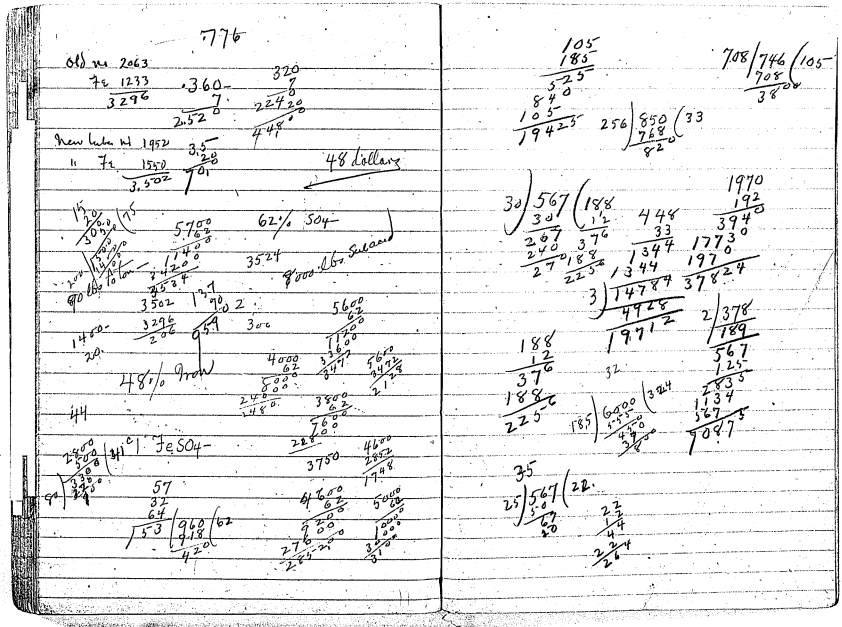
Changed Coulter to read from Amsterdelz —






180
1,250
-280 —
210 —
560
410
004
1/250
150.000
1500
32.00
Purchase of Land


175 — short chg
230 long chg
175
230
125
Muchairchalla



80 chains —

7 grms.

144 / 1008

3 amp 1

446 / 338

192 / 1250 / 960 / 384 / 1843 / 240.000

4500

2 —

76600 / 450

5000 HPhw

288 / 21 / 288 / 576 / 6048

3 | 240 / 80 / 32

192 / 1152 grms Ni / 1008 grms

250 —

144 / 21 / 144 / 288 / 3024

20 | 5000 / 250 —

40 / 100 / 120

34 / 288 / 34 / 1152 — Nickel —

192 / 1152

864 / 9792 grms / 6912

144 / 46 / 1152 / 576 / 691 —

12 / 40 / 144 / 47 / 100 / 76 / 4 / 1681

288 / 33 / 1152 / 576 / 6048 / 4032

4 / 4 / 33 / 1 / 1 / 64 / 7 / 7 / 1

new 1152 Ni — tube 320 grids 480
1008 Fe — pkt 302 " 240

old 9792 Ni — pockets 604 grid 480
6912 Fe — " 302 " 240

1008 / 302 / 240 / 1550

1152 / 320 / 480 / 1952

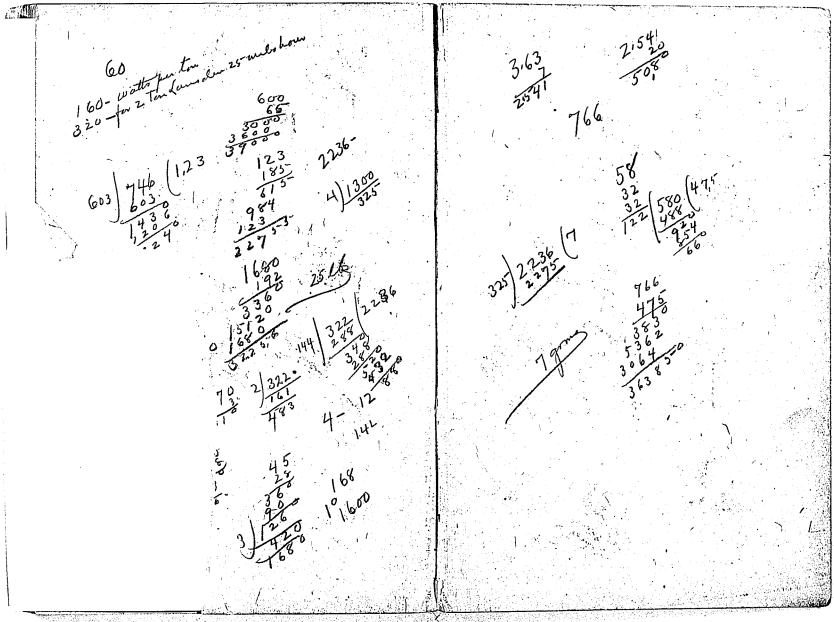
979 / 604 / 480 / 2063

9792 / 604 / 480 / 10876 — total old Ni.

6912 / 302 / 240 / 7454 — total old Fe

691 / 302 / 240 / 1233

1152 / 320 / 480 / 1952


60
160- water per ton
320- for 2 Ton Lunch in 25 minutes hour
603 | 740 | 1,23
603
1,430
1,206
224
6000
65
390000
390000
0
123
183
61
984
1,23
227
5-5
4 | 1300
325
2236
1680
1344
336
0
25.16
151
1680
522
0
144
322 | 2286
288
338
288
50
34
48
2
70
17
2 | 322
161
483
4-12
144
45
25
20
90
126
3 | 420
168
1680
168
10
1600
3,63
2541
21541
20
50800
766
58
32
32
122 | 580
488
92
54
38
325 | 2236 | 17
2275
7 grams
766
478
288
5362
3064
3638
3638200

A Note on the Sources

The pages which have been filmed are the best copies available. Every technical effort possible has been made to ensure legibility.

166

END

FINANCIAL CONTRIBUTORS

PRIVATE FOUNDATIONS

The Alfred P. Sloan Foundation
Charles Edison Fund
The Hyde and Watson Foundation
National Trust for the Humanities
Geraldine R. Dodge Foundation

PUBLIC FOUNDATIONS

National Science Foundation
National Endowment for the Humanities
National Historical Publications and Records Commission

PRIVATE CORPORATIONS AND INDIVIDUALS

Alabama Power Company
Anonymous
AT&T
Atlantic Electric
Association of Edison Illuminating Companies
Battelle Memorial Institute
The Boston Edison Foundation
Cabot Corporation Foundation, Inc.
Carolina Power & Light Company
Consolidated Edison Company of New York, Inc.
Consumers Power Company
Cooper Industries
Corning Incorporated
Duke Power Company
Entergy Corporation (Middle South Electric System)
Exxon Corporation
Florida Power & Light Company
General Electric Foundation
Gould Inc. Foundation
Gulf States Utilities Company
David and Nina Heitz
Hess Foundation, Inc.
Idaho Power Company
IMO Industries
International Brotherhood of Electrical Workers
Mr. and Mrs. Stanley H. Katz
Matsushita Electric Industrial Co., Ltd.
Midwest Resources, Inc.
Minnesota Power
New Jersey Bell
New York State Electric & Gas Corporation
North American Philips Corporation
Philadelphia Electric Company
Philips Lighting B.V.
Public Service Electric and Gas Company
RCA Corporation
Robert Bosch GmbH
Rochester Gas and Electric Corporation
San Diego Gas and Electric
Savannah Electric and Power Company
Schering-Plough Foundation
Texas Utilities Company
Thomas & Betts Corporation
Thomson Grand Public
Transamerica Delaval Inc.
Westinghouse Foundation
Wisconsin Public Service Corporation

THOMAS A. EDISON PAPERS

Robert A. Rosenberg
Director and Editor

Thomas E. Jeffrey
Associate Director and Coeditor

Paul B. Israel
Managing Editor, Book Edition

Helen Endick
Assistant Director for Administration

Associate Editors
Theresa M. Collins
Lisa Gitelman
Keith A. Nier

Assistant Editors
Louis Carlat
Aldo E. Salerno

Research Associates
Gregory Jankunis
Lorie Stock

Secretary
Grace Kurkowski

Student Assistants
Amy Cohen
Bethany Jankunis
Laura Konrad
Vishal Nayak
Jessica Rosenberg
Stacey Saelg
Wojtek Szymkowiak
Matthew Wosniak

Thomas A. Edison Papers
at
Rutgers, The State University
endorsed by
National Historical Publications and Records Commission
18 June 1981

The original documents in this edition are from the archives at the Edison National Historic Site at West Orange, New Jersey.

ISBN 0-89093-703-6

Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION

PART IV
(1899–1910)

Thomas E. Jeffrey
Lisa Gitelman
Gregory Jankunis
David W. Hutchings
Leslie Fields
Theresa M. Collins
Gregory Field
Aldo E. Salerno
Karen A. Detig
Lorie Stock

Editors

Robert Rosenberg
Director and Editor

Sponsors
Rutgers, The State University Of New Jersey
National Park Service, Edison National Historic Site
New Jersey Historical Commission
Smithsonian Institution

University Publications of America
Bethesda, MD
1999


MILLIMETERS
MICROCOPY RESOLUTION TEST CHART
(ANSI and ISO TEST CHART No. 2)
I.0
I.1
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
I.25
I.4
I.6
APPLIED IMAGE, Inc
1653 East Main Street
Rochester, New York 14609
14:1